ANNALS

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. III.

Folio
QK1
.A4758
1891
v.3

ANNALS

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. III.

MISSOURI
BOTANICAL
GARDEN.

1. THE SPECIES OF PEDICULARIS OF THE INDIAN EMPIRE AND ITS FRONTIERS, BY D. PRAIN, M.B., F.R.S.E., CURATOR OF THE HERBARIUM.

2. THE MAGNOLIACEÆ OF BRITISH INDIA, BY G. KING, M.B., LL.D., F.R.S., C.I.E., SUPERINTENDENT OF THE GARDEN.

3. AN ACCOUNT OF THE GENUS GOMPHOSTEMMA, BY D. PRAIN.

4. THE SPECIES OF MYRISTICA OF BRITISH INDIA, BY G. KING.

CALCUTTA:

Printed at the Bengal Secretariat Press.

1891.

TO THE HONOURABLE

Sir Charles Alfred Elliott,

K.C.S.I., LL.B.,

LIEUTENANT-GOVERNOR OF BENGAL,

THIS ATTEMPT TO DESCRIBE AND ILLUSTRATE PART OF THE FLORA OF BRITISH INDIA,

WHICH THE LIBERALITY OF HIS GOVERNMENT

HAS MADE IT POSSIBLE TO PUBLISH,

IS MOST RESPECTFULLY DEDICATED

BY HIS OBEDIENT AND GRATEFUL SERVANT

GEORGE KING.

Royal Botanic Garden, Calcutta,
July 1891.

THE

SPECIES OF PEDICULARIS

OF THE

INDIAN EMPIRE AND ITS FRONTIERS.

BY

DAVID PRAIN,

Curator of the Herbarium, Royal Botanic Garden, Calcutta;
Surgeon, Indian Medical Service.

CALCUTTA:
Printed at the Bengal Secretariat Press.
1890.

PREFACE.

THIS paper consists of descriptions of Indian species of Pedicularis, preceded by a synopsis of the genus in which the probable natural position of the Indian species is shewn.

The area dealt with is not the India of political geography, but an extended *botanical* India, which includes mediatized provinces like Kashmir, Sikkim, and Manipur, and independent ones like Nepal and Ceylon. Within its boundary line, however, there is occasionally only a part of what appears to be a natural phytogeographical district. Where this happens all the species hitherto reported from the district are accounted for; the expression "Indian Frontiers" has been introduced into the title to indicate the fact: species that are confined to districts which lie wholly outside the area dealt with in the *Flora of British India* have been omitted.

Dr. KING, Superintendent of the Botanic Garden, directed me in 1885 to examine the material of this genus brought to Calcutta by collectors in Chumbi and in Sikkim, and to arrange the species in accordance with Sir J. D. HOOKER'S article "PEDICULARIS" in the *Flora of British India* (vol. iv, pp. 306—317). During this examination some novelties were detected—the number of these has since 1885 increased materially—and among them were certain forms that appeared to clear up some difficulties in the systematic disposition of the genus. Owing to this fact and to recent additions of territory to the Empire, a more extended examination of the genus was undertaken, and in conducting it the excellent revision of Asiatic species by Mr. MAXIMOWICZ, published in 1877 and supplemented in 1881, was taken as a foundation. This examination was carried on during intervals between official duties, and was not yet completed when I became aware, in 1887, that Mr. MAXIMOWICZ was engaged in revising the genus anew. The Indian material already systematised was then sent to Mr. MAXIMOWICZ, but that author very strongly deprecated the intention that was formed of suspending the examination; on the contrary, he urged the continuation of the study of the Indian species, and it is to his generosity in supplying material for comparison to the Calcutta Herbarium, and his kindness in making comparisons at St. Petersburg when material could not be spared, that the completion of the paper now is largely due. But I am similarly deeply indebted to the DIRECTOR of the Royal Gardens, KEW, for comparisons made in Kew Herbarium by the staff in 1885 and in 1887, as well as by Dr. KING when he was in England in

1888. During the whole of the investigation, too, Dr. KING has taken the warmest interest in its progress, giving the benefit of his advice at almost every step—much to the advantage of the enquiry itself.

Mr. DUTHIE, Director of the Botanical Department of Northern India, very kindly placed the material of the genus preserved in the Saharanpur Herbarium at my disposal for purposes of study. Without this assistance the investigation of Western Himalayan forms must have been far less satisfactory. Dr. GARCKE of Berlin, whom I consulted regarding some species collected by Dr. Hoffmeister and described by Dr. Klotzsch, generously responded by sending authentic specimens of these to Calcutta. Mr. C. B. CLARKE with equal generosity sent specimens of the *Pediculares* of his Manipur journey, while Dr. G. WATT kindly volunteered the use of the material of the genus contained in his private herbarium.

I am moreover greatly indebted to Dr. LANGE of Copenhagen, to Mr. HEMSLEY of London, and to Dr. TRAIL of Aberdeen for being so good as to verify for me references to works that could not be obtained in Calcutta.

The assistance of all these gentlemen I desire gratefully to acknowledge.

DAVID PRAIN.

HERBARIUM, ROYAL BOTANIC GARDEN, CALCUTTA;
1*st January* 1890.

CONTENTS.

PART I.—INTRODUCTORY.

PAGES.

Chapter I.—HISTORICAL: Tournefort, Linnæus, Willdenow, Steven, Bunge, Bentham, Bentham and Hooker, Maximowicz, Franchet; lines of modification in systems of classification by various monographers 1

Chapter II.—MORPHOLOGY: General habit; root and rhizome; stem; leaves; inflorescence; calyx; disc; corolla,—æstivation, coloration; stamens; ovary, style, stigma; capsule, seeds . . . . . 2—14

Chapter III.—DIAGNOSIS AND CLASSIFICATION OF SPECIES:—Slight value of characters derived from habit in specific diagnosis; moderate diagnostic value of calycine characters and of those derived from fruit and seeds; nature of the diagnostic characters relied on and method of their application; some consequences of the method; groups of species and value of characters derived from habit and from seeds in determining these; higher subdivisions; the characters by which primary subdivisions are to be determined; disadvantages of reliance on habit and on floral structure in the same system; approximately natural divisions—their relative disposition; approximately natural sections—their relative disposition; comparison of the system of Mr. Maximowicz with that now proposed . 14—22

Chapter IV.—GEOGRAPHICAL DISTRIBUTION:—General habitat of the genus; delimitation of *Arctic-Alpine* provinces from their species of *Pedicularis;* the Circumpolar Province; the European; the Siberio-Turkestan; the Japanese; the American; the Chinese; the Himalayan; evidence of the necessity for the recognition of these provinces; subdivisions of the Himalayan Province—the Emodic, the Indo-Chinese, the South Indian; districts of the Emodic subdivision—the Trans-Indus, Panjab Himalaya, Kamaon, Nepal, Sikkim-Chumbi, Bootan-Miri; of the Indo-Chinese subdivision—Assam uplands, Shan plateau, Yunnan; validity of the annexation of Yunnan to the Himalaya; the Southern India district; conspectus of the Himalayan Province; scope of phytogeography; hypothesis of alternating migrations; comparison of the facts of distribution in *Pedicularis* with this hypothesis; deductions from endemic percentages; deductions from morphological evidence; from colour distribution; deductions from phyllotaxis; general considerations; distribution of divisions and sections; special considerations . . . . . 22—58

PART II.—SYSTEMATIC ARRANGEMENT OF THE INDIAN SPECIES.

Chapter V.—HISTORICAL ACCOUNT OF INDIAN SPECIES:—Number and condition of known Indian species; bibliographical history; chronological table of publication; iconography; reductions of the Griffithian species; reductions of the Wallichian Herbarium; object of the conspectus of affinities . . . . . 61—66

PAGES.

Chapter VI.—CONSPECTUS AFFINITATUM :—

PEDICULARIS;

I.—LONGIROSTRES;

§ Siphonanthæ;

A. *Eusiphonanthæ;*
B. *Brevitubæ;*
C. *Oppositifoliæ.*

§§ Orthorrhynchæ;

A. *Tenuirostres;*
B. *Euorthorrhynchæ;*
C. *Axillares.*

II.—ADUNCÆ;

§§§ Rhyncholophæ;

A. *Hyposiphonanthæ;*
B. *Rostratæ;*
C. *Eurhyncholophæ;*
D. *Hyporthorrhynchæ.*

§§§ Bidentatæ;

A. *Oppositifoliæ;*
B. *Veræ;*
C. *Striatæ;*
D. *Racemifloræ.*

III.—EROSTRES;

§§§§ Anodontæ;

A. *Sceptra;*
B. *Cyclophylla;*
C. *Subbidentatæ* . . . . . 66—100

Chapter VII.—SPECIERUM INDICARUM CLAVIS ARTIFICIALIS . . . . . 101—105

PART III.—DESCRIPTIONS OF THE INDIAN SPECIES.

Division I.—LONGIROSTRES;

§ Siphonanthæ; *P. rhinanthoides, longiflora, siphonantha, bicornuta, elephantoides, megalantha, Perrottetii, bella, Przewalskii, Daltoni, Garckeana, robusta, nepalensis, macrantha, Scullyana, Elwesii, integrifolia* . . . . 109—129

§§ Orthorrhynchæ; *P. pectinata, tenuirostris, pyramidata, Oliveriana, brevifolia, instar, gracilis, Heydie, porrecta, confertiflora, flexuosa, chumbica, tenuicaulis* . . . . . 129—145

Division II.—ADUNCÆ;

§§§ Rhyncholophæ; *P. furfuracea, Pantlingii, microcalyx, gruina, flagellaris, curvipes, carnosa, corymbosa, zeylanica, Collettii, odontophora, albiflora, Wallichii, excelsa, lachnoglossa, trichoglossa, Clarkei, Prainiana, Gammieana, schizorrhyncha, alaschanica* . . . . . 146—165

§§§§ Bidentatæ; *P. lyrata, comptoniæfolia, rex, dolichorrhiza* . . . . . 165—168

Division III.—EROSTRES; PAGES.

§§§§§ Anodontæ; *P. Regeliana, globifera, cheilanthifolia, ophiocephala, Roylei, gibbera, polygaloides, denudata, mollis, collata, fragilis, Kingii, pycnantha, Oederi* . . . . . 168—186
Excluded and doubtful species 187, 188
Explanatory note on the illustrations 188
INDEX . . . . . 189—196

LIST OF PLATES.

MAP. Sketch-map of the Northern Hemisphere to illustrate the geographical distribution of PEDICULARIS; to face 22
SCHEMA. Tabula affinitatum; to face 66

PLATE 1. Pedicularis rhinanthoides *Schrenk;* A—D, figs. 1—8.
P. longiflora *Rudolph;* E, F, figs. 9—16.
„ 2. P. siphonantha *Don;* A, B, figs. 1—8, VAR. typica; C, figs. 9—14, VAR. brevituba.
„ 3. P. bicornuta *Klotzsch;* A, B, figs. 1—14.
P. elephantoides *Benth.;* C, figs. 15—21.
„ 4. P. megalantha *Don;* A, B, figs. 1—8, VAR. typica; C, figs. 10—15, VAR. pauciflora: fig. 9 is incorrect and should be neglected.
„ 5. P. Garckeana *Prain;* A, figs. 1—7.
P. bella *Hook. fil.;* B, figs. 8—15.
P. Przewalskii *Maxim.;* C, figs. 16—21.
P. integrifolia *Hook. fil.;* D, figs. 22—27.
„ 6. P. Daltoni *Prain;* A, B, figs. 1—6.
P. robusta *Hook. fil.;* C, D, figs. 7—13.
P. nepalensis *Prain;* E, figs. 14—20.
„ 7. P. macrantha *Klotzsch;* A—D, figs. 1—13.
„ 8. P. Elwesii *Hook. fil.;* A, figs. 1—7, 12.
P. Perrottetii *Benth.;* B, figs. 8—11.
„ 9. P. Scullyana *Prain;* A—C, figs. 1—7.
„ 10. P. gruina *Franch.;* A, figs. 1—5.
P. flagellaris *Benth.;* B, figs. 6—10.
P. Regeliana *Prain;* C, figs. 11—17.
P. odontophora *Prain;* D, figs. 18—23.
„ 11. P. Clarkei *Hook. fil.;* A, figs. 1—7.
P. Prainiana *Maxim.;* B, figs. 8—11.
„ 12. P. lachnoglossa *Hook. fil.;* A, figs. 1—7.
P. trichoglossa *Hook. fil.;* B, figs. 8—15.
„ 13. P. excelsa *Hook. fil.;* figs. 1—7.
„ 14. P. carnosa *Wall.;* A, figs. 1—8.
P. corymbosa *Prain;* B, figs. 9—14.
P. zeylanica *Benth.;* C, figs. 15—21.
„ 15. P. Collettii *Prain;* A, figs. 1—5.
P. comptoniæfolia *Franch.;* B, figs. 6—11.
„ 16. P. furfuracea *Wall.;* A, figs. 1—9.
P. Pantlingii *Prain;* B, figs. 10—17.
P. microcalyx *Hook. fil.;* C, figs. 18—24.
„ 17. P. Wallichii *Bunge;* A, B, figs. 1—8.
P. albiflora *Prain;* C, D, figs. 9—13.

PLATE 18. P. flexuosa *Hook. fil.*; A, B, figs. 1—8.
P. tenuicaulis *Prain*; C—E, figs. 9—16.
„ 19. P. gracilis *Wall.*, VAR. typica; A, B, figs. 1—9, form = P. stricta *Wall.*; C, form = P. Brunoniana *Wall.*
„ 20. P. porrecta *Wall.*; A—C, figs. 1—10.
P. gracilis *Wall.*, VAR. typica; D, E, figs. 11—17, form = P. gracilis *Wall.*, *Cat.*
„ 21. P. gracilis *Wall.*; A—C, figs. 1—7, VAR. macrocarpa *Prain*; D, E, figs. 8—13 VAR. khasiana *Hook. fil.*
„ 22. P. Oliveriana *Prain*; A, figs. 1—7.
P. chumbica *Prain*; B, figs. 8—15.
P. Gammieana *Prain*; C, figs. 16—20.
„ 23. P. pectinata *Wall.*; A, B, figs. 1—11.
„ 24. P. pyramidata *Royle*; A, B, figs. 1—7.
P. tenuirostris *Benth.*; C, figs. 8—15.
„ 25. P. alaschanica *Maxim.*; A, figs. 1—9, VAR. typica; B, figs. 10—12, VAR. tibetica *Maxim.*
P. schizorrhyncha *Prain*; C, figs. 13—19.
„ 26. P. brevifolia *Don*; A—C, figs. 1—7.
P. instar *Prain*; D, figs. 8—13, VAR. typica; E, figs. 14—19, VAR. paradoxa *Prain.*
„ 27. P. confertiflora *Prain*; A—D, figs. 1—8.
P. Heydei *Prain*; E, figs. 9—14.
„ 28. P. Kingii *Prain*; A, figs. 1—5.
P. pycnantha *Boiss.*; B, figs. 6—11, VAR. typica; fig. 12, VAR. Semenowi *Prain.*
„ 29. P. mollis *Wall.*; A, figs. 1—8.
P. gibbera *Prain*; B, figs. 9—16.
P. polygaloides *Hook. fil.*; C, figs. 17—23.
P. denudata *Hook. fil.*; D, figs. 24—31.
„ 30. P. rex *Clarke*; A, figs. 1—8.
P. dolichorrhiza *Schrenk*; B, figs. 9—14.
„ 31. P. fragilis *Prain*; A, figs. 1—6.
P. lyrata *Prain*; B, figs. 7—13.
P. collata *Prain*; C, figs. 14—17.
„ 32. P. cheilanthifolia *Schrenk*; A, B, figs. 1—6, VAR. typica; C, VAR. isochila *Maxim.*
P. globifera *Hook. fil.*; D, figs. 7—12.
„ 33. P. ophiocephala *Maxim.*; A, figs. 1—4.
P. Roylei *Maxim.*; B, C, figs. 5—11.
„ 34. P. Oederi *Vahl*; A, figs. 1—6, VAR. typica; B, C, figs. 7—16, VAR. heteroglossa *Prain.*
„ 35. P. curvipes *Hook. fil.*; A, figs. 1—4.
Pedicularis, sp. incomplete lectum; B.
Indian examples of corolla-types; C, figs. 5—19; × $\frac{3}{2}$.
„ 36. Seeds of Indian Pediculares, No. 1, 'species with leaves alternate); × 20 diams.
„ 37. Ditto ditto, No. 2, (ditto ditto opposite); × 20 diams.
[Plates to follow letterpress of Part III.]

PART I.—INTRODUCTORY.

THE SPECIES OF PEDICULARIS

OF THE

INDIAN EMPIRE AND ITS FRONTIERS.

CHAPTER I.—HISTORICAL.

The Scrophulariaceous genus Pedicularis, which Tournefort[1] had already (in 1700) almost exactly limited, was defined by Linnæus[2] in 1737. In 1753 Linnæus[3] described 14 species, and in 1767[4] two more. Willdenow[5] in 1800 recognised 34 species, and Steven,[6] who prepared a monograph of the genus in 1823, diagnosed 49. Bunge[7] in 1846 enumerated 99 species; in the same year Bentham[8] distinguished 109. Bentham and Hooker[9] found in 1876 that the total had exceeded 120, while Maximowicz[10] in 1881 brought the total up to 153. But in 1888 Maximowicz[11] has had to account for 250 species, and the total has now reached 261. Moreover, when the area still to be investigated is considered, it is certain that many separable forms are yet unreported. M. Franchet[12] indeed has already intimated the existence of some of these.

The arrangement of Linnæus was followed by Willdenow, but Steven, finding it altogether inadequate, elaborated a system the value of which is best appreciated from the fact that although the number of species now known is five times what it was in 1823, subsequent monographers have been able to follow in its author's footsteps. The best systems, those of Bentham and of Maximowicz, are certainly very different from that of Steven, but the modifications are more due to development than to reconstruction. The principle underlying this development has been the recognition and definition of subordinate sections or series consisting of naturally allied forms. Initiated by Bentham, who recognised 18 of these, it has been extended by Maximowicz, who separated 20 such series in 1877 and 28 in 1888. And this principle, as the present synopsis shows, appears capable of still further extension.

---

[1] *Inst. Rei Herbar.* p. 171, t. 77.
[2] *Gen. Plantar.* n. 746.
[3] *Species Plantar.* 607.
[4] *Mantissa Plantar.* 86.
[5] *Species Plantar.* iii, 202.
[6] *Mem. Soc. Mosc.* vi, 55.
[7] *Bull. Phys. Math. Ac. Petersb.* i, 369.
[8] *DC. Prodr.* x, 560.
[9] *Genera Plantarum* ii, 979.
[10] *Mel. Biol.* x, 80, and xi, 278.
[11] *Mel. Biol.* xii, 919.
[12] *Bull. Soc. Bot. de France* vol. xxxvi, *Rev. Bibliograph.* 66, in footnote (2); *see* also below, footnote (1), p. 58.

CHAPTER II.—MORPHOLOGY.

The species of Pedicularis are semi-parasitic or rarely (*P. fragilis*) semi-saprophytic. The difference from a physiological point of view is more one of degree than of kind, and even where specifically constant the latter condition may be regarded as an accident due to environment. It must, moreover, be rare since few species affect localities favourable for the condition.

A few species appear to be truly annual. But the majority of those that have been described as annual or apparently annual are now known to possess perennial rootstocks. In a few of the Indian species the evidence is inconclusive or there is no evidence yet available, but in the majority there is either presumptive evidence from the nature of the rhizome itself, or else direct proof that the species is perennial from the presence in the same specimen of stems belonging to two flowering seasons. The following table shows the extent and the nature of this evidence in a compact form:—

Table I.—*Habit of Indian* Pediculares.

Presumably annual.	Presumably perennial.	Certainly perennial.	Evidence still incomplete for
P. bella.	alaschanica.	cheilanthifolia.	comptoniæfolia.
carnosa.	albiflora.	chumbica.	curvipes.
Collettii.	bicornuta.	collata.	flagellaris.
confertiflora.	brevifolia.	Daltoni.	Gammieana.
corymbosa.	Clarkei.	dolichorrhiza.	Oliveriana.
gracilis.	denudata.	Elwesii.	
gruina.	elephantoides.	excelsa.	
lyrata.	flexuosa.	furfuracea.	
megalantha.	fragilis.	Garckeana.	
mollis.	gibbera.	globifera.	
Perrottetii.	Heydei.	integrifolia.	
polygaloides.	instar.	lachnoglossa.	
rex.	Kingii.	macrantha.	
zeylanica.	longiflora.	nepalensis.	
	microcalyx.	Oederi.	
	odontophora.	ophiocephala.	
	Pantlingii.	porrecta.	
	pectinata.	pycnantha.	
	Prainiana.	pyramidata.	
	Przewalskii.	rhinanthoides.	
	Regeliana.	Roylei.	
	robusta.	schizorrhyncha.	
	tenuicaulis.	Scullyana.	
	tenuirostris.	siphonantha.	
	trichoglossa.	Wallichii.	
	All in this column possess distinct rootstocks, mostly crowned with membranous scales.	Of all in this column there exist specimens at Calcutta with stems of two different seasons attached to the rootstock.	

In those species that appear to be annual the root is woody, the rootlets being either all fibrous (*P. bella*, *lyrata*), or some of these towards the point being tuberous (*P. carnosa*, *corymbosa*, *zeylanica*), the main root in this latter group being premorse. In perennial species the rhizome may be woody with fibrous rootlets only (*P. excelsa*, *brevifolia*, *instar*), with fibrous and tuberous rootlets intermixed (*P. furfuracea*, *microcalyx*, *porrecta*), or with tuberous rootlets only (*P. Heydei*, *tenuicaulis*). More usually the rhizome is thick and fleshy—cactoid—and may either be without rootlets (*P. trichoglossa*, *Clarkei*), may give off fibrous rootlets (*P. Roylei*, *luchnoglossa*), or give off tuberous rootlets (*P. macrantha*, *pycnantha*). The rhizome may be erect or horizontal, and when erect is often branched downwards (*P. Daltoni*, *alaschanica*), but rarely upwards (*P. Wallichii*); when horizontal it very often branches in the direction of growth (*P. odontophora*, *gibbera*, *Regeliana*). The erect rhizome is usually underground or has only the crown projecting above the surface; the horizontal is generally slender and creeps along the surface, only rarely being cactoid (*P. Clarkei*, *Prainiana*, *trichoglossa*), and then deeply buried. Thick fleshy rhizomes usually, woody rootstocks rarely, have a crown of membranous scales. These when the rhizome is erect are crowded and sheath the base of the stem; when it is horizontal they are separated by internodes. They vary from large ovate (*P. pycnantha*, *dolichorrhiza*), or long lanceolate (*P. schizorrhyncha*, *lachnoglossa*), to exceedingly minute (*P. trichoglossa*). Flagella occasionally arise from their axils (*P. Kingii*), and in the species with cactoid underground rootstocks the flagella pass directly to the surface of the soil, giving off immediately below it collars of fibrous rootlets and being continued above into relatively thick stems. And unless specimens are available in which the connection of these flagella with their rootstock remains intact, these species (*P. trichoglossa*, *Clarkei*, *Prainiana*) may readily be mistaken for plants of annual habit.

A small but distinct group of nearly allied forms (*P. Regeliana*, *Artselaeri*, *acaulis*) is stemless; elsewhere in the genus there is a distinct stem—sometimes very short (*P. bella*, *lyrata*, *nepalensis*, *Przewalskii*), but ordinarily more or less elongated, and in two Indian species (*P. excelsa*, *dolichorrhiza*), at times exceeding a metre in height—hollow and round, usually smooth, though occasionally grooved (*P. Clarkei*), or 2—4-gonous, the angles rarely being almost winged (*P. rex*). The thickness varies from that of a crow-quill (*P. tenuicaulis*) to that of the little finger (*P. excelsa*). The stem is usually simple; when branched the branches, like the leaves, may be alternate (*P. carnosa*), opposite (*P. flexuosa*), or whorled (*P. pectinata*). The branches may be fastigiate (*P. Collettii*), or spreading (*P. tenuirostris*), and simple or, rarely, branched a second time (*P. gracilis*). Branching at the base (*P. alaschanica*, *confertiflora*, *cheilanthifolia*, *Roylei*) is not unusual, but branching higher up is exceptional as regards Indian species, though occasionally such branching may occur owing to injury to the upper part of the stem in species not normally characterised by a branching habit.

The stem and branches may be glabrous, but are more often variously hirsute or pilose; not infrequently where the leaves are verticillate the stem is 2—5-fariously hairy, the lines of hairs being determined by the number of leaves in a whorl.

At the base of the stem there is a circle of radical leaves; these usually disappear when the root or rootstock is woody and the rootlets are fibrous, but persist where the rootlets are tuberous or the rhizome is cactoid. And in those species where the roots are sometimes fibrous, sometimes tuberous, the radical leaves correspondingly sometimes are evanescent and sometimes persist. At the same time a few annual species have a rosette of radical leaves (*P. bella*), while some species with thickened rhizomes may lose

them (*P. Wallichii*). And in the species with thickened underground rhizomes that emit flagella which give out fibrous rootlets and are prolonged upwards into apparently annual stems (*P. trichoglossa, Clarkei, Prainiana*) the radical leaves are evanescent. The cauline leaves may be few in number, and then may resemble the radical leaves (*P. Wallichii*), or be markedly unlike them (*P. lachnoglossa*). But usually the cauline leaves are somewhat numerous, differing from the radical leaves mainly in being more shortly petioled or altogether sessile and in having smaller laminæ. The transition as a general rule is gradual where the species has alternate leaves, more abrupt if the leaves be verticillate. But the transition may be abrupt where the leaves are alternate (*P. lachnoglossa*), or gradual where they are whorled (*P. rex*). The length of the petiole is very variable, sometimes it is slightly winged (*P. alaschanica*), very rarely much expanded so that adjacent petioles become connate in a membranous ochreate sheath (*P. rex*). Very often all the cauline leaves are sessile; the radical leaves may also be sessile (*P. Clarkei*), but this is extremely rare. In alternate-leaved species the lamina is usually lanceolate, less often ovate (*P. Collettii*), while in species with opposite or whorled leaves the lamina is oftener ovate than lanceolate (*P. Heydei*). Though the margin is sometimes no more than crenate (*P. bella, carnosa*), it is never in Indian species quite entire:[1] more generally the lamina is pinnatifid to partite; often it is twice pinnate, sometimes even thrice divided (*P. excelsa, Kingii*). The extent of division diminishes as the lamina itself decreases in size towards the apex of the stem.

The floral leaves may be only distinguishable, if distinguishable at all, from the cauline in size, in which case the flowers are merely axillary (*P. fragilis, flexuosa, gibbera*). This is most usual in species with verticillate leaves. These floral leaves are then generally smaller than the cauline; sometimes, however (*P. flexuosa*), they are of the same size, rarely (*P. denudata*) the lower floral leaves are distinctly larger. But at times in verticillate-leaved species, and usually in those with alternate leaves, the floral leaves are modified into distinct bracts. In a few cases the transition to the bract region is sudden (*P. excelsa*); as a rule it is gradual, and the lowest flowers occur in the axils of what are only smaller cauline leaves. Bracts vary from ovate to lanceolate, with margins serrate throughout (*P. lachnoglossa*), serrate only at the apex (*P. trichoglossa*), or entire (*P. tenuirostris*); are usually sessile and represent only a modified lamina, but are sometimes distinctly petioled (*P. excelsa*), and occasionally represent mainly a modified petiole with only the rudiment of a lamina left at the tip (*P. Oederi*).

The flowers may be sessile or sub-sessile and the inflorescence sub-capitate or sub-spicate, or distinctly pedicelled and the inflorescence racemose. When this is accompanied by a loosely branching stem (*P. gracilis, Kingii*) the inflorescence becomes paniculate. When pedicels are present the flowers are usually erect; sometimes (*P. curvipes, resupinata*) they are deflexed.

The flowers as a rule open centripetally, but it is by no means unusual for those in the lower axils to open later than the rest, as exceptions (*P. dolichorrhiza, villosa*), or as a rule (SIPHONANTHÆ generally). In the former case it is clearly not an instance of centrifugal opening; in the latter it is by no means certain. The condition is constant among the SIPHONANTHÆ, and the evidence from herbarium material will be examined in connection with the subject of æstivation, but careful field observation is necessary in order to clear up the point. There are, however, frequent examples in high Alpine

[1] The leaves in two species—both American (*P. angustifolia, Howellii*)—are undivided.

specimens of an exceptional, but yet distinct, centrifugal opening (*P. cheilanthifolia*), and a centrifugal inflorescence is constantly present in, and is highly characteristic of, the Arctic group *Hirsutæ*.

The calyx consists of a tube which may be ovate (*P. Elwesii*), campanulate (*P. gruina*), cylindric (*P. Perrottetii*), or subinflated (*P. Wallichii*), and of teeth which may be minute (*P. comptoniæfolia*), but are generally distinct, and then are either oblong or triangular with a broad base, or ovate with a narrow base. The tube varies in consistence from thinly membranous (*P. rex*), or membranous (*P. fragilis*), to herbaceous (*P. gracilis*), or thickly herbaceous (*P. bella*), and may sometimes even be sub-coriaceous (*P. integrifolia*). In a few cases tube and teeth are of the same consistence. As a rule in calyces with wide-based teeth the margin, and in those with narrow-based teeth the whole tooth, is of firmer consistence than the tube.

The tube is always longitudinally nerved; five strong main nerves pass upwards into the calyx teeth with usually five slender intermediate nerves that fork near the limbus into marginal nervules for two adjacent teeth. As a rare occurrence these secondary nerves may all be absent, but as a rule where the upper tooth is weak the upper main nerve is of the same thickness as the adjacent secondary nerves, while when the upper tooth altogether disappears and the calyx is 2-dentate, these adjacent secondary nerves are not traceable, and the posterior nerve may either pass entirely into one lateral tooth (*P. rex*), or more usually may fork into the two lateral teeth (*P. carnosa*). The longitudinal nerves may be unbranched (*P. rex*), but usually those that pass directly into the teeth give off lateral nervules that may be confined to the teeth only (*P. verticillata*), or extend throughout the upper third or half of the tube (the most usual condition), sometimes even to the base of the tube (*P. dolichorrhiza*). The normal number of teeth is five, but the upper tooth, except in a small number of species with triangular teeth, is distinctly smaller and less incised than the other four. Of the remainder the two nearer the upper tooth are almost always distinctly larger than the anterior pair. But often there are only three teeth (*P. siphonantha, longiflora*), in which case the two lateral pairs are confluent, and sometimes only two (*P. carnosa, Collettii, curvipes*) from the further abortion of the naturally weaker upper tooth, or very rarely (as in the already quoted case of *P. rex*) from the absorption of the upper tooth in one or other of the lateral ones. The lateral nervules of triangular or oblong teeth anastomose with the marginal branches derived from the forking secondary nerves; the lateral nervules of narrow-based ovate teeth are disposed like the nerves of a small leaf or bract. The length of the teeth relatively to the calyx tube may vary considerably in the same species (*P. bicornuta*), but the proportions of the teeth to each other remain very constant. But it has to be noted that in normally 5-toothed species the lateral pairs of teeth on one side or on both may be conjoined (*P. Elwesii, megalantha*), while similarly the lateral teeth of normally 3- or 2-toothed species (*P. carnosa, longiflora*) may on one side or on both be divided. Besides being toothed, the limbus is usually cleft in front, occasionally to the base (*P. rex*), sometimes $\frac{2}{3}$ to $\frac{3}{4}$ of its depth (*P. Elwesii, furfuracea*), but usually only from $\frac{1}{4}$ to $\frac{1}{2}$, and occasionally the limbus is not perceptibly cleft (*P. gracilis, gruina*). In 2-dentate species it is cleft also, though less extensively, behind. The margins of lanceolate or oblong teeth may be entire, or serrate at the apex only (*P. Oederi*), or throughout (*P. Clarkei*); those of ovate teeth are always dentate or incised, the segments not infrequently being mucronate. These dentations may be erect, or deflexed at the tip only, or altogether, and sometimes the whole tooth is deflexed. These conditions give

rise to an appearance often described as crenate. A truly crenate margin (*P. Collettii*) is exceedingly rare.

The disc is not enlarged at all in many species, but in the larger moiety it is slightly enlarged anteriorly. This enlargement is not as a rule conspicuous, though in one Indian species (*P. rex*) it projects as an almost vertical process from two-thirds to quite as long as the ovary, and protrudes in front between the margins of the completely cleft calyx.

The corolla consists of a tube, sometimes of uniform calibre but usually expanded upwards, whereon the stamens are inserted. The limbus is divided into a patent 3-fid lip (*labium*) below and a compressed hood (*galea*) enclosing the style and stamens and prolonged or not into a beak (*rostrum*) above. Its æstivation is that characteristic of the EUPHRASIEÆ. The midlobe of the lip is outermost in the bud, the hood is inmost, and where the lip is large enough to cover the hood completely, the left lateral lobe overlaps the right. The beak, when present, is somewhat variably disposed. The tube, sometimes even shorter than the calyx, usually equals or somewhat exceeds it, and at times (as in most SIPHONANTHÆ and some RHYNCHOLOPHÆ) it is long and slender and much exceeds the calyx. Even when ultimately longest it is late of development, the hood and lip, as well as the anthers and ovary, attaining almost their full size before it begins to elongate. In young buds of all species the filaments are inserted close to the base, and where no great elongation takes place the staminal insertion is not carried any great distance up the tube, very frequently only to a point opposite the top of the ovary and in a few cases (*P. Kingii*) not quite so far. The same condition is met with in those cases where the elongation of the tube takes place chiefly in the portion between the staminal insertion and the limbus (*P. corymbosa, pectinata, gruina*). Where, on the other hand, the elongation is uniform throughout the tube we obtain the condition most usual among ORTHORRHYNCHÆ (but also very common in other sections) of staminal insertion in the middle of the tube, while in those cases where the elongation takes place only between the staminal insertion and the base of the tube we obtain the staminal insertion at the top of the tube—a condition that characterises the SIPHONANTHÆ.

The amount of elongation varies considerably, as the subjoined table shows, and does not therefore afford a reliable diagnostic character, but the portion that elongates is always the same, and therefore supplies a character of the greatest value.

TABLE II.—*Variation in length of Corolla tube in Indian species of* § SIPHONANTHÆ.

I.	II.		III.	IV.		V.
SIPHONANTHÆ.	LIMITS OF VARIATION IN THE SPECIES—		Number of separate gatherings.	LIMITS OF VARIATION IN INDIVIDUAL SPECIMENS—		Localities of the specimens in column IV.
	Of corolla tube	Of calyx.		Of corolla tube.	Of calyx.	
1. Eusiphonanthæ.						
P. bicornuta ...	16—26 mm.	15—19 mm.	22	21—26 mm.	16 mm.	Pangi.
elephantoides ...	18 mm.	14·5 mm.	1	18 mm.	14·5 mm.	Kashmir.
longiflora ...	33—74 mm.	10—11 mm.	32	42—55 mm.	10 mm.	Alpine Sikkim.
				40—54 mm.	10·5 mm.	Chumbi.
megalantha ...	21 - 94 mm.	15—20 mm.	33	44—52 mm.	16 mm.	Buck-cheem, Chumbi.
rhinanthoides ...	14—27 mm.	11—13 mm.	21	14—21 mm.	12·5 mm.	Pangi.
siphonantha ...	22—60 mm.	9—10 mm.	58	24—29 mm.	9·5 mm.	Lebang Pass in Kamaon.
bella ...	26—36 mm.	15 mm.	6	30—33 mm.	15 mm.	Chum-la-ree.
Przewalskii ...	28—34 mm.	10—12 mm.	3	28—30 mm.	10 mm.	Phari.
2. Macranthæ.						
Daltoni ...	17—23 mm.	12 mm.	7	18—20 mm.	12 mm.	Donkia-la.
Elwesii ...	13—15 mm.	11—17 mm.	10	13 mm.	11 mm.	Phari.
Garckeana ...	16—28 mm.	14—17 mm.	7	16—19 mm.	16 mm.	Tan-ka-la.'
macrantha ...	10—13 mm.	13 mm.	8	11—13 mm.	13 mm.	Nampa Gadh in W. Nepal.
nepalensis ...	21—26 mm.	14 mm.	1	21—26 mm.	14 mm.	Kogling in E. Nepal.
robusta ...	11—12 mm.	11—12 mm.	3	11 mm.	11 mm.	Alpine Sikkim.
Scullyana ...	20—22 mm.	18—19 mm.	5	20—22 mm.	18·5 mm.	Jongri.
3. Gyrorrhynchæ.						
integrifolia ...	17—24 mm.	12—13 mm.	4	17—21 mm.	13 mm.	Phari.

The figures in column III indicate the number of *gatherings* from which the measurements given in column II are taken; to give the number of specimens measured in every case seems unnecessary. Measurements of over 200 specimens of *P. siphonantha* have been made, and measurements of 23 specimens of *P. nepalensis*. The only species in the list whereof the measurements must be considered inconclusive is *P. elephantoides*, of which but one gathering containing only two specimens has been available. The localities in column V are those of the individual specimens whose measurements are given in column IV.

This table has been limited to § SIPHONANTHÆ because this is the section of which an elongated tube is most characteristic, and is the one in which most use has been made of its morphological index—the relative length of calyx and corolla tubes. The table shows that the character is too variable to be capable of other than a very general application.

The morphological index of the portion of tube that elongates—the point of insertion of the stamens—affords, on the other hand, a character of high diagnostic value. When the staminal insertion is carried to the apex of the tube, the calibre is uniform throughout; when not carried so far, the tube, as a rule, enlarges slightly upwards from this point. This enlargement takes place even among SIPHONANTHÆ in those species where the staminal insertion is some distance below the apex (*P. macrantha*, *Scullyana*, *Daltoni*). But there are many species, more particularly among ORTHORRHYNCHÆ, where the staminal insertion is at the middle of the tube (*P. flexuosa*, *chumbica*), and some both amongst ORTHORRHYNCHÆ (*P. pectinata*) and amongst RHYNCHOLOPHÆ (*P. gruina*), where the staminal insertion is opposite the top of the ovary, yet with the tube cylindric throughout or only very slightly enlarged at the apex. The contrary condition,

however, nowhere prevails: the portion of tube between the staminal insertion and the base, whether short or long, is of uniform calibre. The staminal insertion in *P. pectinata* and *P. tenuirostris* is at the base of a transverse indentation of the tube, but this arrangement occurs nowhere else, and is absent from the very nearly allied *P. pyramidata*.

The tube in SIPHONANTHÆ and in ORTHORRHYNCHÆ is straight, but in many RHYNCHOLOPHÆ and in most BIDENTATÆ it is curved, the concavity being anterior. In ANODONTÆ it is very frequently angularly bent either within the tube or opposite the limbus of the calyx. In some cases this infraction is absent, and the tube may be straight (*P. Kingii*) or incurved (*P. pycnantha*). The amount of infraction varies somewhat, but the situation of the angle is constant for individual species.

The lip is always 3-lobed, and usually is rounded in front, very rarely narrowing gradually from a wide base. In ANODONTÆ and BIDENTATÆ the lip is stipitate, the base being erect and 2-cristate above, and the lobes usually too small to envelope the hood in the bud. Even when sufficiently large to do so, they are early deflected and permit the hood to appear. In SIPHONANTHÆ and ORTHORRHYNCHÆ the lip is sessile, the lateral lobes overlapping in the bud and quite covering the hood, while the base is narrow and uncrested. In RHYNCHOLOPHÆ the lip may be stipitate with a wide base and with distinct crests (*P. Collettii*, *zeylanica*), with a narrow base and then with only rudimentary folds near the base of the lobes (*P. Clarkei*, *Prainiana*), or without folds (*P. lachnoglossa*); or it may be sessile (*P. carnosa*, *gruina*) and without folds. The lobes are usually rounded, with the margin entire, or with the midlobe (*P. siphonantha*), or all three (*P. longiflora*) truncate, but are sometimes ovate (*P. corymbosa*), or obovate (*P. Perrottetii*). When rounded the midlobe is as a rule somewhat narrower than the lateral lobes; when ovate or obovate the lobes are nearly always equal in size. In a few cases (*P. Kingii*, *fragilis*) the lateral lobes are narrower than the central; in these instances the midlobe is rounded while the lateral lobes are ovate. The margin is often ciliate, a character which is extremely constant in individual species.

The hood consists of two distinct portions—a basal continuous with the tube and an upper which encloses the anthers. The basal part is always of the same consistence as the tube and generally of the same width, is always erect and generally of the same length as the upper portion, though it may be distinctly longer (*P. schizorrhyncha*), or may, on the other hand, be almost absent (*P. excelsa*). The margin is usually distinctly thickened, sometimes sinuate (*P. longiflora*, *furfuracea*), sometimes toothed (*P. siphonantha*, *odontophora*), and sometimes replicate (*P. Oederi*, *pycnantha*). The upper part or hood proper is, except in ANODONTÆ, of firmer consistence, and is generally a little wider than the basal portion. In ANODONTÆ it is erect and continuous with the base; in BIDENTATÆ, most RHYNCHOLOPHÆ, and in SIPHONANTHÆ it is curved; while in ORTHORRHYNCHÆ it is angularly bent. The margin in ANODONTÆ and in some RHYNCHOLOPHÆ is entire or is toothed only at the lower angle (*P. Regeliana*); in BIDENTATÆ it is toothed immediately below the apex; while in most RHYNCHOLOPHÆ and in all save one species of the LONGIROSTRES it is prolonged at the apex into a distinct beak. The beak, like the tube, is late of development, and though discernible in the bud, it is impossible to say from its condition there whether it will remain rudimentary (*P. globifera*), become short and thick (*P. alaschanica*), slender and falcate (*P. gruina*), straight (*P. flexuosa*), flexuose (*P. pectinata*), or circinnate (*P. siphonantha*). Neither the absolute length of beak nor the relative lengths of beak and lip or of beak and hood afford reliable characters in diagnosis. The apex of the beak may be entire, emarginate, or deeply bifid, and this condition, which

is evident in the very youngest bud, is of high diagnostic value. The æstivation of the beak appears to afford important evidence as to the structural affinities of species. Owing to the lateness of development of the beak, young buds afford less information than might be expected. But the interpretation of the conditions is materially assisted by various accidental circumstances. In the SIPHONANTHÆ the flowers in the axils of the lower bracts, if they open at all, open later than those higher up. These lower unopened flowers are not, however, necessarily undeveloped; on the contrary, the beak elongates till it attains its full size and the tube also elongates and lies in zig-zag folds imprisoned in the lower portion of the calyx-cup. Only careful study in the field can determine whether we have here a mere case of centrifugal opening or a condition akin to cleistogamy. The morphological aspect of the arrangement is, however, as interesting as the biological, and, so far as the beak is concerned, admits of the following definition:—*Axis of beak parallel to median line of lip with direction reversed*, since the dorsal entire aspect of the beak is apposed to the lip, and the apex is directed to the throat of the corolla. It may be expressed by the notation $\begin{matrix} R \rightarrow \\ L \leftarrow \end{matrix}$ (the arrow R standing for the beak, the arrow L representing the lip). In all ORTHORRHYNCHÆ an opposite condition prevails. It is seen in its simplest form in species where beak and lip are of the same length (*P. gracilis*, *flexuosa*), but is equally evident in species with long flexuous beaks (*P. pectinata*, *pyramidata*), and may be defined as follows:—*Axis of beak parallel to median line of lip with direction the same*, since the ventral divided aspect of the beak is apposed to the lip, and the apex is directed to the margin of its middle lobe. The notation here would be $\begin{matrix} R \leftarrow \\ L \leftarrow \end{matrix}$ (R as before representing the beak and L the lip).

It is not easy to imagine a condition intermediate between two such opposite arrangements, but it is interesting to find that in most of the beaked RHYNCHOLOPHÆ a condition exists of which the two arrangements already described might be equally well derivates. It may be stated thus:—*Axis of beak perpendicular to median line of lip with direction at right angles*, since the ventral divided aspect of the beak is directed towards the throat of the corolla, and the apex is apposed to the middle of the lip. This condition may be symbolized as

(where R is again the beak, L the lip).

The correlation of beak and tube deserves notice. In those species where the beak is pronounced the corolla tube tends to become of uniform calibre, in those species where the corolla tube is infundibuliform there is no beak. This is made more striking owing to the fact that in the SIPHONANTHÆ, of which a tube with uniform calibre is highly characteristic, species which have a short beak (*P. macrantha*, *robusta*) have also a slightly widened tube, and in the highly natural groups, so common amongst RHYNCHOLOPHÆ, of which some members possess while others are without beaks, the beaked forms (*P. carnosa*, *gruina*, *polyphylla*) have almost uniform tubes, while the corresponding beakless ones (*P. zeylanica*, *Henryi*, *tenuisecta*) have them infundibuliform. The lip also is involved in this alteration; as the beak elongates and the tube constricts its base shortens, its crests disappear, and its lobes enlarge. Inside the tube in front it is usual to find in short-beaked species a number of long hairs; these may be confined to the lower part of the tube (*P. zeylanica*), or extend to the base of the lip (*P. rex*). This condition also tends to disappear when the corolla tube is contracted, as it is in long-beaked species.

The tube and the basal part of the hood are of the same texture, and are more delicate than the lip, which in turn is thinner than the hood proper with which the beak, when present, is uniform. The only exception to this is in the ANODONTÆ, where hood and lip are of the same consistence as the tube. In the corolla as a whole there are all gradations from the greatest delicacy (*P. Kingii, gracilis*) to a sub-coriaceous texture (*P. trichoglossa*). The nerves of the tube are parallel and pass into both lip and hood. In particular species the nervation is highly constant, and in the lip may consist of one central nerve with lateral nervules for each lobe, of one central main nerve in the midlobe, and three main nerves in each lateral lobe, or of three main nerves in every lobe. The central main nerves branch to both sides; the lateral main nerves, more especially of the midlobe, branch to the outside only as a rule, though sometimes all three nerves in each of the three lobes branch in both directions. The secondary nervules always anastomose, though often not very visibly; sometimes, however, the anastomosis gives a characteristic areolate appearance to the lip (*P. Scullyana*). The nerve in the tube that corresponds to the insertion of the posterior stamen on each side does not pass vertically upwards into the hood, but arches forward and ends in the margin at the point which indicates the junction of the base with the hood proper. As a rule, this nerve simply disappears in the thickened margin, but sometimes (*P. siphonantha, odontophora*) it is prolonged as the median nerve of a distinct tooth; at other times (*P. longiflora, furfuracea*) it is lost at the base of a distinct sinuation. This nerve gives off from its upper convex aspect a series of parallel branches that form, along with the prolonged nerves of the tube posterior to the two arching nerves, the nerve system of the hood proper and, if it be present, of the beak also.

Steven long ago observed that in many species with a spicate inflorescence the whole corolla is obliquely twisted, so that a spiral arrangement of the flowers is the result, and that in almost all the species known to him the lip is oblique. Maximowicz, too, has observed in living specimens that in some species the whole corolla, but more especially the hood, is twisted dextrorsely (with the sun), the lip at the same time being oblique, but without noting whether the upper surface of the lip looks towards or is averted from the sun.[1] Nothing can be said definitely of obliquity of lip in dried specimens, but as regards the hood the twisting is very evident, even in the herbarium. Sometimes it involves both tube and hood (*P. macrantha*); at other times it is confined to the hood (*P. excelsa*). The significance of this phenomenon is worthy of study in the field; the morphological result and the arrangements by which it is effected are capable of interpretation, in the case of the LONGIROSTRES at all events, and if a sufficient number of flowers be examined, even in the herbarium. Whatever the arrangement may be, the result is in every case the same—the removal of the apex of the beak, and along with that the stigma, from the lip, which is presumably the platform inviting insect visitants to the flower. One arrangement which effects the result is met with in the flexuose-beaked ORTHORRHYNCHÆ (*P. pectinata*). Here the flower does not open till the beak is fully elongated. The apex of the beak is at the margin of the midlobe of the lip; the terminal convoluted portion of the beak is lodged in this lobe, the portion behind being straight. While the flexuous portion is being developed in this confined space, it becomes, as a matter of accommodation, twisted on its own long axis, and this twist becoming permanently impressed on the beak, causes its apex, and along with it the stigma, to be averted from the lip (Plate 23, f. 12), instead of turned towards it (Plate 23, f. 1) when the flower opens. But this is not all. The elongating beak tends to push the

[1] Maximowicz, *Mel. Biol.* xii, 775.

whole lip downwards, and at the same time towards the side on which the overlapping, and therefore most easily displaced, lateral lobe lies. This being usually the left side, the thrust of the beak is downwards and towards the left. But there is thus an equal and opposite counter-thrust upwards and to the right acting upon the hood. And since the basal portion of the hood is of a more delicate texture than either the hood proper or the lip, the chief result is a certain amount of twisting to the right at that place as the point of least resistance. But although this is one, it is not the only, and indeed can scarcely be the usual, explanation of dextrorse twisting.

Other notable means of attaining the same result occur among the Siphonanthæ. In *P. megalantha* the lateral lobe of the lip overlapped by the other grows more slowly.[1] This prevents the growth of the hood in an erect position. Being thus deflected in the unexpanded flower, the hood retains this attitude when the flower opens. Sometimes the apex of the beak remains permanently entangled in this dwarfed lateral lobe. The apex of the beak also becomes averted from the lip by the unequal development of the margin and of the rest of the hood. Not infrequently (*P. Elwesii*) the margin grows most rapidly, and thus, by throwing back the dorsum of the hood, at the same time tilts the apex of the beak upwards and away from the lip. More remarkable still is the arrangement that occurs in *P. bicornuta*. Here the growth of the margin of the hood is arrested while that of the rest proceeds. The result is exactly what is seen when the string that closes the mouth of a canvas money-bag is tightened. The basal portion of the hood, especially in the vicinity of the margin, is thrown into many plaits and folds, and these now deflect, now reverse, now invert the upper portion—in every case removing the tip of the beak, and with it the stigma, from the neighbourhood of the lip.

The colour of the corolla varies from a pale or rose pink (*P. furfuracea*) to dark purple (*P. integrifolia*); or from green (*P. fragilis*), or dirty white (*P. pycnantha*), to yellow (*P. Scullyana*); a few species are pure white (*P. albiflora*). Stated in the most general terms, the colour is either some shade of red or some shade of yellow, corollas of both types giving rise, either as sports or permanently, to white. At the same time a species may be red in one locality and yellow in another (*P. myriophylla*, *megalantha*, *altaica*), but this is not very usual.

Red is slightly the more common of the two, 151 of the species, or 57·8 per cent. of the whole, being of this colour. There is, besides, a marked association of red colour with the character of opposite leaves, and an equally marked association with the presence of a beak. These correlations with structure are, however, probably indirect, and depend rather on geographical distribution. The subjoined table exhibits the facts of the case more compactly (the colour of four species being doubtful):—

Table III.—*Relation of Colour of Corolla to Structure.*

Colour of Corolla.	Pink, red, or purple.		Green, yellow, white, or doubtful.	
A.—Irrespective of structural characters ...	151	57·8%	110	42·2%
B.—In species with—				
1. Alternate leaves	88	52 %	83	48 %
2. Opposite „	63	70 %	27	30 %
C.—In species with—				
1. Beaked corolla	93	70 %	39	30 %
2. Beakless „	58	45 %	71	55 %

[1] This condition has also been noticed by Mr. Maximowicz (*Mel. Biol.* xii, 777) as conversely affecting the position of the lip itself.

Yellow corollas frequently show streaks (*P. striata*) or patches (*P. Oederi*) of red. These streaks are often confined to the lip or occur on lip and tube; the patches are usually restricted to the hood. Even when in general terms these markings are specifically constant (*P. Oederi*), they may be altogether absent (VAR. *heteroglossa*), or may involve the whole corolla (VAR. *rubra*). But similar markings not infrequently appear as sports on corollas that are normally concolorous. Thus *P. longiflora* in the Eastern Himalaya has sometimes a dark red hood and beak, while both in Sikkim and in Northern Tibet it may have a purple lunule on each side of the central line of its usually concolorous lip. On the other hand, this species sometimes occurs with corollas uniformly white, and in this case it might easily be mistaken for *P. siphonantha* (which also at times has white corollas), if too great reliance were placed on characters of colour or attention not directed to the other diagnostic characters.

The variation of colour in normally red corollas differs somewhat, and consists of the appearance of a greater or less amount of white. This white may appear in blotches (*P. farfuracea*, *siphonantha*), but this is somewhat rare; and if so, these are confined to the tube and the lip. The usual variation is that the tube, the base of the hood, and the centre of the lip become uniformly white, the lobes of the lip, the hood proper, and the beak remaining red (*P. confertiflora*, *zeylanica*). In some species indeed this disposition of colour is the normal one (*P. carnosa*, *corymbosa*, *odontophora*), while, generally speaking, the tube in red corollas is paler in tint than are the lobes of the lip, and these in turn are paler than the hood. Finally, species with normally red corollas may have pure white flowers (*P. siphonantha*), while species whose affinities are clearly with groups in which red corollas normally prevail (*P. albiflora* amongst the *Rostratae*) may have white flowers only.

The staminal insertion has been already discussed. The filaments are narrow and ligulate with a mesial main nerve, and occasionally (*P. bicornuta*, *elephantoides*) with wavy margins. The filaments elongate considerably in those species where the staminal insertion is not carried upwards by the elongating tube. Both pairs of filaments may be hirsute and equally so, or with the posterior pair less densely hairy than the anterior; or only the anterior pair may be hirsute, the posterior pair being glabrous. On the other hand, all may be glabrous, but in no instance do we find the posterior pair hirsute while the anterior pair are glabrous. The hairs may prevail throughout the filament; more usually they are confined to the upper portion, and may or may not involve the connective. Sometimes, besides being hairy above, they are villous at the point of insertion (*P. pectinata*), and, very rarely, are villous only at the point of insertion but glabrous elsewhere (*P. Collettii*). The staminal hairs are very early formed, and are present in the youngest buds, and this condition affords one of the most constant and most useful diagnostic characters of the genus. The anthers are free and parallel, are usually obtuse, but may be sharply tailed (*P. Kingii*), and as a rule lie horizontally. They may, however, have the tails inclined slightly upwards, and oftener still slightly downwards, only very rarely (*P. Perrottetii*) are the long axes of the anthers vertical.

The ovary is ovate or lanceolate, usually slightly oblique, and always with two locules. The placentas are double and vertical, and are confined to the lower third or fourth of the transverse septum. The ovules are amphitropous with usually a short funicle, are normally some multiple of four, there being two rows on each placenta, and vary from 4 in each locule (*P. gibbera*) to 56 in each locule (*P. corymbosa*). The style, at first erect, curves backwards to approach the tube at the level of the limbus of the

calyx. Beyond this point it follows the curvature in succession of the tube, of the hood, and, if it be present, of the beak. As a rule the style is of uniform thickness, but in one species (*P. superba*) it increases in thickness towards the stigma.[1] The stigma is sub-capitate, generally (though rarely very far) exserted, but sometimes distinctly included (*P. lachnoglossa*). The enlarging fertilised ovary detaches the corolla from the disc and at the same time splits the tube upwards from the base in the middle line behind. It is rare, however, for the corolla to be immediately caducous (*P. excelsa*); as a rule it becomes gradually extruded by the elongating capsule till the base is clear above the mouth of the calyx tube. Then as a rule it either falls off or is blown away, but it is by no means unusual to find the tip of a ripened and dehiscing capsule still crowned by a withered corolla.

The capsule varies a good deal in the genus as a whole, but is very constant in size and form within specific limits and often throughout natural groups of species. The relative length of capsule and calyx affords a more useful character than that of calyx and corolla tube. This is not alone because the capsule is much more constant than the corolla tube, which is, as has been seen, rather variable, but because the teeth, to which the variation of the calyx is principally confined, usually become in the fruit shrivelled and less conspicuous, and because the enlarging capsule by expanding the calyx tube renders the limbus more easily discernible between the bases of the teeth. The usual shapes of capsule are lanceolate or ovate-lanceolate, rarely sub-rhomboid (*P. rex*), and in these cases with the apex oblique and in front of the middle line; not infrequently, however, the capsule may be ovate (*P. trichoglossa*, *pycnantha*), or rarely sub-globular (*P. fragilis*), and in these cases with the apex erect and central. Its surface is smooth and variously reticulated, and (except in *P. fragilis*, where the capsule is transparent and almost herbaceous) its walls are of a firm consistence; it varies in colour (in herbarium specimens) from pale tan to black. The capsule is persistent, being always found attached to the stems of a former season where these happen to be collected. The dehiscence is loculicidal, but is confined to the upper third of the anterior and the upper half of the posterior suture, the valves nearly always remaining coherent (even in specimens showing stems of a second season) from the base to opposite the upper limit of the placental surfaces.

The seeds vary greatly throughout the genus in number, size, shape, colour, and surface markings; in individual species, on the other hand, these characters are very constant. In number they vary from 3—4 in each locule (*P. gibbera*) to 18 or 20 (*P. dolichorrhiza*); in size from 0·6 × 0·6 mm. (*P. fragilis*) or 1·2 × 0·7 mm. (*P. carnosa*) to 3·5 × 2·0 mm. (*P. Clarkei*) or 4·25 × 2·0 mm. (*P. pycnantha*); in shape from spherical (*P. fragilis*), ellipsoid (*P. Clarkei*), egg-shaped and narrower at the lower extremity (*P. longiflora*), egg-shaped and narrower towards the apex (*P. gibbera*), to nearly fusiform (*P. curvipes*). In transverse section the seeds are usually rounded or ovoid, rarely triquetrous (*P. schizorrhyncha*). The hilum is indicated by a furrow, the upper portion of which is often filled by a spongy crest which, though of different appearance and lighter colour, is in reality only a modified portion of the testa developed from the coats of the ovule where these surround the micropyle. At the lower extremity of the seed there is also in many species what appears to be a distinct process. But this also merely consists of testa, not even modified, and has no special structure. It is most obvious where the testa is thin and closely adpressed to the albumen, and is not visible at all if

[1] Maximowicz, *Mel. Biol.* xii 874.

the testa is very lax. In colour the testa varies from black (*P. furfuracea*), slate grey (*P. gibbera*), dark brown (*P. rhinanthoides*), or rusty brown (*P. siphonantha*), to pale tawny (*P. megalantha*), or pale straw colour (*P. Oederi*). But colour is not, and will probably never become, a character of great practical value in distinguishing the seeds of different species of *Pedicularis*, because the differences are so often mere variations of shade not equally appreciated by all observers; because these shades appear to become lighter as the seeds ripen; and finally, because there is no guarantee that the seeds are not, sometimes at least, altered in colour while the specimens are being dried. The most useful characters afforded by the seeds are those derived from the nature and the markings of the testa. Sometimes this is thin and closely adpressed to the albumen (*P. longiflora*), and then the surface is only marked by slight longitudinal striæ; at other times it is much more extensive, the albumen not nearly filling it, and is then lax and deeply pitted. All possible intermediate conditions occur, and these are best expressed in terms of the pitting which results, and which is the most prominent feature of the seed.[1] There is in most cases a distinct appearance of longitudinal ridging that runs meridionally from apex to base. The ridges are only an accentuation of the condition producing the striation that exists when the testa is closely adpressed to the albumen, but in addition to this the furrows between are crossed by transverse ridglets that complete the periphery of the characteristic pits. Where these transverse ridglets are narrower and less in relief than the meridional ridges—and this is the usual condition—a pitted and furrowed appearance go together. But where the transverse ridges equal the meridional ones in width and height, a net-like appearance is imparted to the testa, and this becomes more and more apparent when the testa is obviously more extensive in relation to the albumen (*P. brevifolia*, *denudata*), while not infrequently where the testa is very extensive indeed (*P. trichoglossa*, *Clarkei*), the periphery of the pits becomes irregularly hexagonal and the surface assumes a honeycombed appearance. As a rule, the markings are uniform throughout the testa, but sometimes (*P. pectinata*, *comptoniæfolia*, *dolichorrhiza*) the funicular aspect of the seed is thus irregularly (and generally very irregularly) honeycombed, while the remainder of the surface is ridged and pitted in a regular manner. And sometimes where the testa is very loose, the ridged arrangement still persists (*P. alaschanica*) and produces a gilled appearance; the meridional gill-like ridges have transverse pit-forming ridglets on both sides.

The albumen is firm, and the embryo, which is straight, occupies a mesial cavity in the upper portion of its mass. Usually the embryo is from one-fourth to one-third the length of the albumen, rarely (*P. pycnantha*) exceeding one-half. The radicle points upwards; the semi-cylindric cotyledons in the opposite direction.

CHAPTER III.—DIAGNOSIS AND CLASSIFICATION OF SPECIES.

In diagnosing the species of Pedicularis, characters afforded by habit are of comparatively small value. This is partly because habit varies greatly within the limits of individual species, partly because quite distinct species very frequently display remarkable identity of habit. This identity is not, however, necessarily confined to vegetative organs alone, as is the case with *P. lachnoglossa* and *P. Parryi*; *P. Roylei* and *P. verticillata*; *P. megalantha* and *P. chinensis*, but may extend to floral characters, and this to

[1] *Cf.* plate 36 and plate 37 for examples of the conditions detailed in the text.

such an extent that at length only a single character may be left whereby a diagnosis between two, sometimes even more than two, species can be effected. Only a few of the many examples of this need be mentioned:—*P. Oederi* can only be diagnosed from *P. flammea* (unless seeds be available) by the hairs on its anterior filaments; *P. Clarkei* from *P. Prainiana* (unless the colour of the flower be noted) by the presence of a beak to the corolla; *P. corymbosa* from *P. crenata* on the one hand by the absence of a beak, and from *P. zeylanica* on the other by the much longer hood; *P. rhinanthoides* from *P. siphonantha* by its calyx being 5- not 3-toothed and by the apex of the beak of its corolla being entire; while *P. siphonantha* itself is only with certainty separable from *P. longiflora* (if the colour of the corolla is not noted) by the absence of hairs from its posterior filaments and the presence of a distinct tooth on the margin of the hood. Careful analysis of the floral structure in every gathering is therefore absolutely essential for accurate diagnosis.

The opposite condition, with considerable difference of habit and great similarity of floral structure, is rare in this genus. Still instances do occur, and those of *P. pycnantha* and *P. Oederi*, *P. globifera* and *P. anas*, *P. Gammieana* and *P. binaria*, *P. Collettii* and *P. zeylanica*, may be mentioned. The calyx affords less useful characters than the corolla or the stamens, partly for the reason given above, partly because it is somewhat more variable within specific limits. There do, however, occur instances where calycine characters are of high value. One of these, pointed out by Sir J. D. Hooker, is the case of *P. Elwesii*. Another excellent example is furnished by *P. Pantlingii*, which is at once distinguished from the otherwise very similar *P. furfuracea* by its uncleft calyx. A parallel instance among European species is the case of *P. foliosa* and *P. sumana*.

The same thing is true of the gynæcium, less, however, because of the constancy of its characters than because its modifications are usually accompanied by greater differences in the other parts of the flower. This remains largely true of the fruit. There are indeed some instances where the capsule or the seeds afford excellent diagnostic characters:—the seeds of *P. flammea*, as Dr. Lange has pointed out, are as distinguishable from those of *P. Oederi* as are the stamens; the characters of the seeds of *P. Roylei* make it impossible to merge that plant in *P. verticillata* as Mr. Bentham proposes, whatever elasticity be given to the limits of the Linnean species; and *P. Wallichii* differs even more markedly from *P. asplenifolia*, to which Mr. Bentham has referred it, by its capsule and its seeds than by its habit and its flowers. Another case where the evidence from the fruit is unmistakeable is *P. longiflora*, which cannot be confounded with *P. siphonantha* at the same stage even if the habit, leaves, locality, date of collection, and *collector* be identical, owing to a double curvature of the lower edge of its capsule which the capsule of *P. siphonantha* wants, and to the absence of that pitting of the testa which the seeds of *P. siphonantha* exhibit. But the general rule is the reverse of this; where there is identity of habit between two or more species accompanied by a greater or less repetition of floral characters, the condition is even more marked in the capsule and the seeds than in the calyx. Among the most striking examples of this are *P. carnosa*, *P. corymbosa*, and *P. zeylanica*, the capsules and seeds of which are practically indistinguishable; *P. pectinata*, *P. pyramidata*, and *P. tenuirostris* afford an equally instructive instance.

It is then sufficiently clear that in this genus only floral characters can be relied on in diagnosing nearly allied forms, and repeated and careful analysis of the flower in large suites of specimens is necessary for a just appreciation of the limits of species even if

the term is to be applied in the most provisional sense. At the same time it is very evident from the morphological account of the genus how few in number the reliable diagnostic characters really are.

In the present paper use has only been made of such characters as appear to be absolutely constant within the limits of the genus. In using calycine characters, for example, a calyx of which the limbus is cleft has been contrasted with one of which the limbus is not cleft at all; no use is made of the extent of the cleavage. And in using corolline characters a tube dilated towards the apex is contrasted with a tube not there dilated, the amount of dilatation being considered of altogether subsidiary value. Then while the extent of elongation of the tube, as indicated by the relative length of calyx and corolla, is not used in diagnosis, the portion of tube which elongates, as indicated by the position of the staminal insertion, is employed. Only a subsidiary value is assigned to the relative length of the lip when compared with the hood, while characters derived from its outline (whether with lobes truncate or entire) and from its margin (whether ciliate or glabrous) have been used as diagnostic. Similarly a high diagnostic value is assigned to the fact that a beak is present or is absent; also when the beak is present to the fact that it is lodged in the bud with its apex towards the edge of the lip or towards the throat of corolla, and to the fact that its apex is entire or not entire, while only a subsidiary value is assigned to the mere length of beak or to the extent of its bifurcation when it is bifid. Finally, great value is attached to the condition of the filaments whether hirsute or glabrous (though when they are hirsute little weight is attached to the mere degree of pubescence), as well as to the surface markings of the seeds, which are, as Lange has pointed out, absolutely constant.[1] The fact of constancy, then, is the key to the value of the characters selected; they are such as appear to be constant not merely for individual species, but for the whole genus.

One consequence of rigid adherence to the principle now explained is that certain forms usually accepted as specifically distinct are here accorded only varietal rank or are altogether reduced. Thus *P. cabulica* Bth. is joined to *P. dolichorrhiza* Schrenk; *P. Semenowi* Regel to *P. pycnantha* Boiss.; *P. ochroleuca* Duthie to *P. macrantha* Klotzsch; *P. labellata* Jacquem. to *P. rhinanthoides* Schrenk. It does not follow because this has been done that the characters whereby these forms are separable are not constant so far as the two particular forms are concerned. The reduction indicates only that the characters on which it is necessary to rely in order to effect the diagnosis in these special cases are characters that are clearly not constant in certain other species of the genus. On the other hand, specific rank has in a few cases been accorded to forms already recognised as distinct, but hitherto only treated as varieties. Thus *P. asplenifolia* var. *albiflora* Hook. f. is here treated as a species apart from *P. asplenifolia* Floerke, and *P. furfuracea* var. *integrifolia* Hook. f. as a species apart from *P. furfuracea* Wall., because in these instances the characters by which the forms are separable are characters which are constant in the genus as a whole.

To this treatment of forms of the latter class exception will probably not be taken, since it is already certain that the forms are truly distinct. With forms of the first class it is altogether different, since the treatment here proposed for them involves a fundamental difference of opinion as regards their rank. The reductions involved by the application of the canon have therefore only been effected in those species that actually occur within the area dealt with in this paper, because it seems improper to propose such

[1] Lange, *Kiaerskou, Kjobn. Bot. Tidsk.* iv, 247, et seq.

a course without explaining fully, as is done in the notes following the individual specific descriptions, the reasons for adopting the view that is here published. The non-application of the canon affects, but only slightly, the numbers and proportions in the distribution tables so far as the European province is concerned, since for it the recent clear and careful account of the European species by Herr Steininger has been closely followed, and since that author separates as species forms that are capable of differention only by characters that a wider study of Siberian, Chinese, and Himalayan ones shows to be variable within the limits of the genus. For example, *P. lusitanica* is specifically separable from *P. sylvatica* only by relative characters, and by the present canon can only be a variety of the latter; and *P. Friderici-Augusti*, which Caruel[1] declares to be the same species as *P. petiolaris*, is kept apart by Steininger[2] (who cannot understand why this reduction should be proposed) only by two or three vague differences of habit and by the different colour of corolla, which last, though certainly a striking character, has not always a really diagnostic value, as the evidence of *P. megalantha* and some other species very distinctly shows.

But, as Sir J. D. Hooker has clearly shown,[3] species are by no means units of equal value. This is especially true of the "species" of *Pedicularis*, however rigid be the canons applied in defining them. Clearly species that differ from each other so little as does *P. carnosa* from *P. corymbosa*, or *P. Clarkei* from *P. Prainiana*, or *P. polyphylla* from *P. tenuisecta*—the first of each of these pairs has a beaked, the other a beakless corolla, while the members of each pair agree so closely as to habit, calyx, capsule, and seeds that the verbal description of all these characters has in both to be identical—are more closely related to each other than species like *P. Oederi* and *P. pycnantha*, which with very similar corolline characters differ in habit so fundamentally that the first has alternate leaves with a continuous spiral centrifugal inflorescence, the other opposite leaves with an interrupted verticillate centripetal spike.

In *Pedicularis*, as in *Thalictrum*, in *Rubus* and in *Saxifraga*, this arrangement of the separable forms in evidently natural groups is a characteristic feature. And it is probable that these groups, rather than the forms here termed "species," constitute the natural units of the genus. It is therefore of some importance to recognise and define the limits of these groups, since otherwise a system of classification might be adopted that in its application divorced naturally allied forms. The evidence as to the composition of these natural "groups" is in many respects the converse of that which enables us to define "species." In such groups forms that agree in the greatest possible number of characters are brought together; consequently the characters that prove least reliable in specific diagnosis are those that are of greatest value in distinguishing them. Habit, calyx, and capsule now give useful characters; and it is as indicative of affinity between allied species rather than as diagnostic of separable ones that seed-characters are chiefly

[1] Caruel in *Parlatore, Flor. Ital.*, vol. vi, p. 437.

[2] Steininger in *Uhlworm und Behrens, Botan. Centralblatt*, xxix, p. 315. Herr Steininger's diagnosis is as follows:—"*P. petiolaris* is separable from *P. Friderici-Augusti* by its oblique rootstock with stouter roots, its stem which is never glabrous, and has few leaves unevenly disposed, but mostly near the base of the spike, by its differently-shaped bracts which are longer than the calyx, by the colour of the corolla, etc." The writer adds:—"It is very difficult to conceive how it is possible for Caruel to propose the union of this species with *P. Friderici-Augusti*." But for those who have examined large suites of undoubtedly conspecific Siberian and Himalayan forms, the difficulty will be to conceive how with these characters alone it is possible to propose that these two forms are to be looked on as separable specifically.

[3] Hooker: *Introductory Essay to Flora of Tasmania*, p. v; also *Outlines of the Distribution of Arctic Plants, Trans. Linn. Soc.*, vol. xxiii, p. 279.

valuable. The component forms of these groups do not shade into each other in *Pedicularis* so gradually as they do in the other genera alluded to, so that there is less tendency on the part of authors to reduce species prematurely than there is to treat intermediate forms, that are probably quite stable, as hybrids.[1]

The arrangement of groups in higher subdivisions—*Sections* of Bentham, *Series* of Maximowicz—is a still more difficult matter, but the greatest difficulty of all is experienced in determining what are the approximately natural primary divisions. Linnæus and Willdenow arranged their species according to characters derived from habit, while Steven, experiencing the inadequacy of such characters as the number of species increased, relied, in defining five of his primary divisions, viz. *Personatæ*, *Faucidentes*, *Rostratæ*, *Bicuspidatæ*, and *Edentulæ*, on characters derived from the structure of the corolla; only one of his divisions, *Verticillatæ*, being, as its name indicates, based on a character derived from habit. It is somewhat curious that while the other five tribes have been recast and modified so that only the outline of one (*Rostratæ*) has been retained, and not one of them even in name continues as a primary division, the *Verticillatæ* have continued in every subsequent revision of the genus to hold primary rank and to retain the original or an equivalent name.

The time appears to have now come for the abandonment of this last Stevenian section, for though the primary division based on the constant possession or the reverse of whorled or opposite leaves is a highly natural one, and gives rise to two subdivisions, viz.—

(1) opposite-leaved species, forming 35·7 per cent. of the whole, and

(2) alternate-leaved species, forming 64·3 per cent. of the whole,

this is only one step towards subdividing the genus, and we have to seek in floral structure the evidence necessary to ensure further subdivision. The most striking floral character undoubtedly is the presence or absence of a beak to the corolla. When, however, we enquire what relationship this bears to a division based on phyllotaxy, we find it one of practical indifference, as the appended table shows :—

TABLE IV.— *General relationship of phyllotaxis to floral structure.*

Species with	Corollas beaked.	Corollas beakless.
leaves alternate	45 per cent.	55 per cent.
„ opposite	55 „	45 „

The cleavage plane indicated by phyllotaxis is thus at right angles to that indicated by floral structure; and when on further subdividing the genus according to floral characters it is found that there is not a single type of corolla amongst alternate-leaved species that is without a parallel amongst opposite-leaved ones it becomes evident that phyllotaxis and floral structure cannot both continue to be employed to indicate subdivisions of

[1] Steininger in *Uhlworm, Bot. Centralblatt*, xxx, p. 22, who clearly shows the hybrid character of several separable European forms, treats *P. atrorubens* in this fashion, and considers it equal to *P. incarnata* × *recutita*. That it is the intermediate form in that group to which the presumed parents belong is certain; that it is a hybrid is, I believe, doubtful. In this case, too, Herr Steininger does not advance any direct proof of his contention.

equal rank. The question is which of the two is to be abandoned as the primary character. And the answer seems clear; phyllotaxis in future, except in the formation of artificial keys to species, must take a subordinate position. The reasons for this view are the following. In the first place the proportion of beaked to beakless corollas—

Corollas beaked ...	...	...	...	49·4 per cent. of the whole,
„ without beaks ...	...	...	...	50 6 „ „

shows that this character, while quite as natural as the phyllotaxic one, divides the genus much more evenly. Again, both the beaked and beakless divisions may be further sub-divided by floral characters, while a primary division by phyllotaxis once effected leads to nothing beyond. Finally, a subdivision based on floral structure may be hoped to throw light on the developmental history of the genus: one based on habit cannot do so, or can only do so indirectly.

At first sight it would appear that the most natural as well as most simple method of subdividing the genus must be into—

(1) groups wherein the corolla is beaked;
(2) „ „ „ is not beaked.

But the occurrence of groups that are in the highest degree and in the most obvious manner natural, such as the *Acaules*, *Recutitæ*, *Carnosæ*, *Tristes*, and many more, which nevertheless within their particular limits exhibit a transition from a beakless to a beaked condition as complete as that shown by the genus as a whole, makes the recognition of an intermediate subdivision absolutely necessary. By recognising this we obtain three divisions, clearly not quite natural in their limits, and therefore not deserving to be called sub-genera, but apparently in accordance with the genealogical arrangement of the groups, and so possessing the advantage of being capable of a serial disposition. Arranged so as to pass progressively from the more to the less specialised groups, these are:—

Division I.—LONGIROSTRES;—Corolla tube straight, slender, uniform; lip large, sessile, more delicate in texture than the firm, long-beaked hood.

II.—ADUNCÆ;—Corolla tube curved, cylindric, slightly enlarged towards the top; lip sessile or stipitate, more delicate in texture than the beaked or beakless hood.

III.—EROSTRES;—Corolla tube infract, infundibuliform; lip stipitate, base erect, 2-cristate above, lobes patent of same texture as beakless hood.

But this arrangement, while it accords with facts of structure, implies a simplicity of natural disposition that a closer study of these facts dispels.

Thus the division LONGIROSTRES contains two highly natural sections:—

§ SIPHONANTHÆ; corolla tube usually much elongated; filaments inserted between middle and top of tube and usually just below the apex; beak in bud circinnate, with dorsal aspect apposed to median line of lip and apex directed to throat of corolla.

§§ ORTHORRHYNCHÆ; corolla tube much shorter; filaments inserted at or below middle of tube; beak in bud straight or flexuous, with ventral aspect apposed to median line of lip and apex directed to edge of midlobe.

Similarly the ADUNCÆ consist of two natural sections:—

§§§ RHYNCHOLOPHÆ; corolla lip sessile or stipitate with usually rudimentary crests; filaments inserted at or below middle of tube; beak in bud falcate, with apex apposed to median line of lip; hood sometimes beakless.

§§§§ BIDENTATÆ; corolla lip stipitate, base erect, 2-cristate above; filaments inserted opposite top of ovary; hood beakless or shortly wide-beaked, always 2-dentate immediately below the apex.

The EROSTRES constitute a single large section containing the whole of the forms with corollas showing what appears to be the most archaic type of structure:—

§§§§§ ANODONTÆ; filaments inserted opposite top of ovary; hood erect, beakless or with very short rudimentary beak, edentulous or only toothed at the lower angle and with apex always rounded.

The natural disposition of these sections is not one of sequence. So far as SIPHONANTHÆ and ORTHORRYNCHÆ are concerned, the evidence of this is direct and abundant. Conditions intermediate between the types of beak æstivation in these two not only do not exist, but are hardly conceivable, and they cannot have well descended the one from the other. On the other hand, the type of beak æstivation in RHYNCHOLOPHÆ is precisely that which is capable of being modified in either of the directions assumed in the other two types, and as a matter of fact the RHYNCHOLOPHÆ include groups of species that are indicative of such transition. Thus the *Oliganthæ* are clearly transitions to SIPHONANTHÆ; the *Myriophyllæ* to ORTHORRHYNCHÆ.

In the same way, while there is abundant evidence among the ANODONTÆ of transition to BIDENTATÆ—*P. Langsdorfii*, *P. collata*, *P. fragilis* may be quoted as examples—and the evidence of transition from ANONDONTÆ to RHYNCHOLOPHÆ is overwhelming—witness the groups *Carnosæ*, *Flagellares*, *Tristes*, *Recutitæ*, and others—there is no good evidence of transition from BIDENTATÆ to RHYNCHOLOPHÆ.[1] On the other hand, there is not the positive structural evidence which is to be obtained regarding SIPHONANTHÆ and ORTHORRHYNCHÆ that such transition is impossible. In the light, however, of the great body of direct evidence of transition from ANODONTÆ both to RHYNCHOLOPHÆ and to BIDENTATÆ, and of the absence of evidence of any direct connection between RHYNCHOLOPHÆ and BIDENTATÆ, we seem justified in assuming that both RHYNCHOLOPHÆ and BIDENTATÆ are derived immediately from ANODONTÆ. In any case we are not entitled to accord to the BIDENTATÆ a position intermediate between ANODONTÆ and RHYNCHOLOPHÆ.[2]

---

[1] The chief evidence that has been advanced is the connection between *P. cabulica* Benth., (placed next to *P. uncinata*) and *P. dolichorrhiza* Schrenk. But this evidence entirely fails because it now appears that *P. cabulica* is nothing but a condition of *P. dolichorrhiza*.

[2] The conclusion to which the consideration of evidence from distribution leads is that the BIDENTATÆ are of more recent origin than the RHYNCHOLOPHÆ are. And if this conclusion be justified (the evidence on which it rests is to be found below—p. 56), it furnishes the direct proof necessary for the establishment of the hypothesis here advanced.

The following diagram assists the eye in appreciating the natural relationship of these sections:—

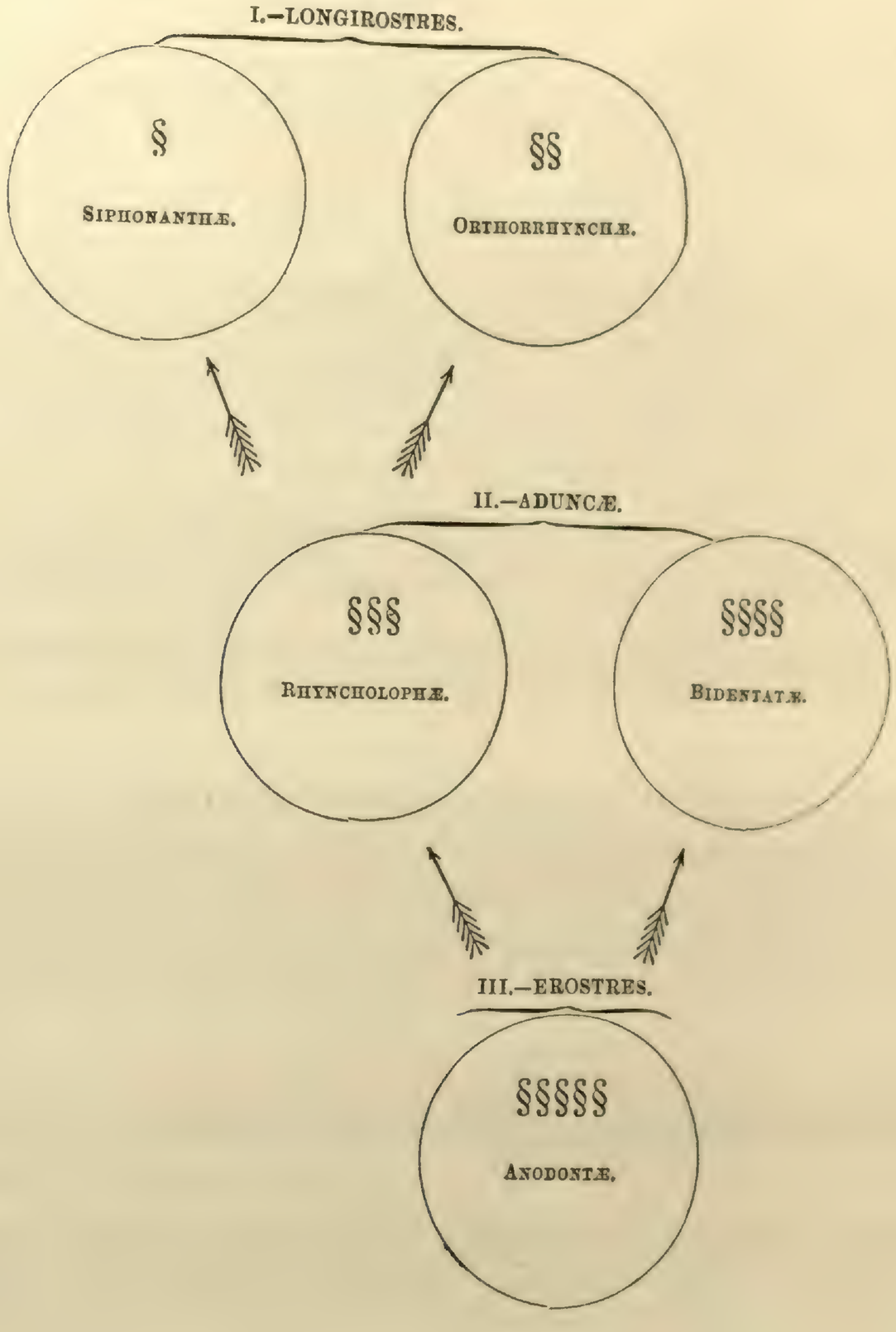


DIAGRAM 1.

Quasi-natural sections of genus *Pedicularis* genealogically disposed.

The system now proposed is after all a simplification at the expense of some natural affinities. But it is offered as an approximation to a natural disposition that at the same time possesses the compactness requisite in a systematic arrangement.

The relation that this system bears to that of Mr. Maximowicz remains to be noticed. Both attempt to do what it is perhaps impossible with this genus to succeed in doing—to show compactly the natural disposition of its component groups. And the subjoined table shows that the two systems are practically identical.

TABLE V.—*Comparison of the system of Mr. Maximowicz with that now proposed.*

System of Mr. Maximowicz.	Present system.
Tribe I.—LONGIROSTRES.	Division I.—LONGIROSTRES.
1. Siphonanthæ.	§ Siphonanthæ.
2. Longirostres verticillatæ.	§§ Orthorrhynchæ.
Tribe II.—RHYNCHOLOPHÆ.	Division II.—ADUNCÆ.
	§§§ Rhyncholophæ.
Tribe III.—VERTICILLATÆ.	§§§§ Bidentæ.
Tribe IV.—BIDENTATÆ.	Division III.—EROSTRES.
Tribe V.—ANODONTÆ.	§§§§§ Anodontæ.

The tribe LONGIROSTRES of the first column is almost the exact equivalent of the division of the same name even in its subdivisions, for the section SIPHONANTHÆ consists of the major portion of Mr. Maximowicz' sub-tribe of the same name along with those few opposite or whorled-leaved species that have circinnate beaks, while the section ORTHORRHYNCHÆ is exactly equal to the sub-tribe LONGIROSTRES VERTICILLATÆ for which a new descriptive name is proposed in order to indicate that here it is accorded sectional rank. The tribes RHYNCHOLOPHÆ and BIDENTATÆ are here treated as sections belonging to one division, since they occupy the same position as regards each other that the sections SIPHONANTHÆ and ORTHORRHYNCHÆ mutually occupy, and together bear the same relation to ANODONTÆ that the SIPHONANTHÆ and ORTHORRHYNCHÆ together bear to RHYNCHOLOPHÆ. Finally, the tribe ANODONTÆ is practically the equivalent of the division EROSTRES, the latter, however, including in its single section ANODONTÆ not merely the alternate-leaved species that constitute the ANODONTÆ of Mr. Maximowicz, but the majority of the species contained in the tribe VERTICILLATÆ. Practically, therefore, the only great alteration in the system now proposed is the suppression of the tribe VERTICILLATÆ. The reasons for so doing have been already given, and the act is only an extension to the rest of the genus of the treatment that Mr. Maximowicz has already shown to be necessary for the verticillate Longirostres. The destination of the series that constitute the artificial tribe VERTICILLATÆ is as follows:—*Myriophyllæ* to § RHYNCHOLOPHÆ; *Platyrrhynchæ*, *Superbæ*, and *Lyratæ* to § BIDENTATÆ; *Cheilanthifoliæ*, *Verticillatæ*, and *Caucasicæ* to § ANODONTÆ.

CHAPTER IV.—GEOGRAPHICAL DISTRIBUTION.

THE genus is restricted to the NORTHERN FLORA, and its species are almost entirely confined to the areas inhabited by its *Arctic-Alpine secondary Flora*, although a few are extended in, or even confined to, the areas marked by the *Northern Temperate-intermediate*

secondary Flora.[1] But the number of these species is so small, and the areas affected by them are so evidently only the temperate complements of adjacent Arctic or Alpine areas, that it does not become necessary to recognise for the genus any temperate provinces.[2] For this reason, and with the exception of the northern *Circumpolar* province itself, the various provinces are indicated by the mountain systems and differentiated by the intervening seas and plains of the northern hemisphere.

The evidence from the distribution of any single large genus being the converse of that from the composition of local floras, an attempt is now to be made to estimate the value of such evidence by delimiting the various *Arctic-Alpine* provinces from their species of *Pedicularis* alone.[3] Its application requires the recognition of eight provinces, the names and limits of which are given below. Each province is expressed in terms of its "endemic percentage," such districts as increase this factor being added together, such as diminish it being removed. Thus in the delimitation of the Circumpolar province it is found to be necessary to add to it the peninsulas of Kamstchatka and Alaska, which appear to be natural districts and seem conjointly to form a natural division. The alternatives open are to unite both to America, to Japan, or to Siberia; to unite only Alaska to America and to apportion Kamstchatka either to Japan or to Siberia; or, finally, to look upon the two as forming a province apart. The last is an inadmissible course, since their removal from the Circumpolar province decreases its endemic percentage. If both, or if Alaska only, be united to America, the endemic percentage both of the Circumpolar province and of America is diminished by the act, and a similar result also happens if both, or if Kamstchatka only, be united either to Japan or to Siberia. It is probably not altogether an accident that the Northern Summer Isothermal of 15°C.—the best graphic index of the temperature conditions that chiefly affect circumpolar vegetation (mean annual temperature being obviously of very subordinate importance)—should coincide so exactly with the distribution of circumpolar *Pediculares*. But although this coincidence occurs, and although this Isothermal is therefore employed as the most convenient expression of the boundary of the Circumpolar province, it is to be distinctly remembered that the existence of this line is not a factor in the process of reasoning whereby the actual delimitation is effected. Similarly neither physiographical features nor climatic conditions have been used in the delimitation of the other seven provinces, since it is plain that without a rigid adherence to evidence derived from morphology alone in the definition of biological areas, the ultimate comparison of biological with physiographical and meteorological facts becomes a process of circular reasoning.

The Circumpolar province is bounded by the Northern Summer Isothermal of 15°C. and borders successively on the European, Siberian, Japanese, and American provinces. It contains 20 species, $\frac{1}{13}$ of the whole; of these 10 are endemic, and one other is represented only by an endemic variety:—the endemic percentage is thus 52·5.

---

[1] Thiselton-Dyer: *Lecture on Plant-distribution as a field for geographical research*, 1878, pp. 12—14, where and in the subsequent pages a most excellent working system of Phytogeography is outlined.

[2] It seems advisable to avoid the use of the term Region, as this word has unfortunately become stereotyped in England and in Germany to indicate areas of different value, and because there is no special aptness in either the English or the German employment of the word.

[3] Mr. Maximowicz says the time has not yet arrived for a final discussion of the distribution of this genus (*Mel. Biol.* xii, 783). This is quite true; still our knowledge of six of the provinces is certainly fairly complete, and of the remaining two (Tibeto-China and Himalaya) probably fairly representative (*see* footnote 1, p. 58).

The European province, indicated by the Pyrenees, Alps, and Carpathians, extends northward to the lowlands of Scandinavia and eastward to the Volga.[1] To the south it includes the mountain systems of the three Mediterranean peninsulas. It is bounded on the north by the Circumpolar, on the east by the Siberian, on the south-east by the Caucasian provinces. It contains 40 species, $\frac{1}{7}$ of the whole; of these 34, or 85 per cent., are endemic.

The mountain-system lying north-east of the great Central Asian desert indicates the Siberio-Turkestan province. Besides the several sections of this system—the Tian-shan, Alatau, Altai, Sajan, Baikal, and Jablonoi ranges—the province includes the plains of Turkestan and Siberia to the west and north, and of Yarkand (East Turkestan), Soongaria, *Northern* Mongolia, and Mandshuria to the south and east of them, while on the extreme east it includes Saghalien. In the east it thus is in contact with the Japanese province, to the north it passes into the Circumpolar, to the west into the European, to the south-west into the Caucasian, and then for a short distance into the Himalayan provinces. It is separated from the Chinese province on the south by the desert of Gobi. It has already yielded 50 species, about $\frac{1}{5}$ of the whole; of these 32 are endemic, and one other is represented only by an endemic variety:—the endemic percentage is thus 65.

The islands forming the empire of Japan constitute the Japanese province. It has but slight connection on the west with the Chinese, on the north-west with the Siberian, and on the north with the Circumpolar provinces. It possesses eight species, of which four are endemic, two others are represented only by endemic varieties, while of still another, which extends to Japan from Siberia and China in its typical condition, Japan possesses an endemic variety. The eighth species, moreover, (*cf. Maxim., Mel. Biol.* xii, 892) has only recently been reported from the extreme south of China, and the Chinese plant is by no means positively identified by Mr. Maximowicz with the Japanese species. The endemic percentage is 66·6.[2]

The American province comprises British Columbia, Manitoba, and Canada, the United States, Mexico, and, finally, a small isolated Andean district in New Grenada. It passes on the north into the Circumpolar province. There have been reported from it 24 species, about $\frac{1}{11}$ of the whole; of these 21, or 87·5 per cent., are endemic.

The Caucasian province includes the Caucasus, extends north to the Kuban and Kuma rivers—or to 45° N. Lat. between the Euxine and the Caspian—and, through the intervening Armenian highlands, south-west to the Taurus and Asia Minor, south-east to the Elburz and Persia. It has but slight connection with the European province on the west, along the north-east it passes into the Siberio-Turkestan, and on the extreme east into the Himalayan provinces. It contains 15 species, $\frac{1}{20}$ of the whole, of which 11, or 73·3 per cent., are endemic.

The Chinese province is indicated by the Kuen-lun, Nan-shan, and Peling ranges. It extends northwards to the desert of Gobi, which separates it from the Siberian region, and southwards through the intervening tableland of Tibet to the Indus, the Sanpo, and the Yang-tse-kiang rivers, passing, however, insensibly into the Himalayan province.

---

[1] P. læta *Stev.*, having been collected in Southern Ural, between that and the Volga, and even between the Volga and the Donetz (*Maxim., Mel. Biol.* xii, 906), and P. resupinata *Linn.*, having been reported from Perm (*Maxim., l. c.* x., 107), it becomes necessary to remove these districts from Europe and annex them to Siberia. P. sylvatica *Linn.* is, as Blytt has shown, an immigrant species in the extreme south-west of Scandinavia.

[2] If the identification referred to (P. refracta *Maxim.*) is not sustained, this percentage becomes 79·1.

To the east there is a slight connection with Japan. This province has already yielded 49 species, or about $\frac{1}{5}$ of the whole; of these 35, or 71·4 per cent., are endemic.

The remaining province, the Himalayan, is indicated by the Hindu-Kush, Karakoram, Himalaya, Yunnan, and Nan-ling (southern Nan-shan) ranges, including also the isolated mountain system of the Western Peninsula and the various parallel ranges of the Eastern Peninsula that pass northwards into Yunnan. It meets with the Caucasian and Siberio-Turkestan provinces on the extreme west, and is bounded by the Chinese province on the north. It has already yielded 101 species, of which 90, or 89·1 per cent., are endemic. These provinces are shown on the accompanying map, while the subjoined table shows the facts of *Pedicularis* distribution within them more compactly:—

TABLE VI.—*Distribution of the genus* Pedicularis.

PROVINCE.	Total number of species.	Number of species endemic.	Percentage endemic.
Circumpolar	20	10½	52·5
European	40	34	85·0
Siberio-Turkestan	50	32	65·0
Japanese	8	5⅓	66·6
American	24	21	87·5
Caucasian	15	11	73·3
Chinese	49	35	71·4
Himalayan	101	90	89·1

The endemic percentages of these provinces seem to indicate very fairly the amount of their isolation. Thus the Circumpolar province, which has the lowest percentage, is in the first place central in situation; its climatic conditions of necessity pass most gradually into those of the adjacent areas, and probably also most closely resemble those under which the genus was evolved; it is nowhere separated from these areas by wide seas or rainless deserts; on the contrary, it possesses organic physiographical connections with each in turn. It is connected with Europe by the Scandinavian Alps, with Western Siberia by the Ural Mountains, with the Siberio-Turkestan mountain system by the Stanovoi range, with Japan by the Kamstchatdale hills and the Kurile islands, with America by the Rocky Mountains. And in the cases especially of the Siberio-Turkestan and of the American provinces, these connections provide still an unbroken continuity of *Alpine-Arctic* climatic conditions.

It is instructive to consider the effects of ignoring the existence of this Circumpolar province, and of parcelling it out among the adjacent provinces. Thus if the most specious, because apparently most natural, annexation of all is made and the circumpolar species occurring in Arctic America are considered along with species of the true American province the total number of American species is raised to 31. But only 2 of

the circumpolar species are confined to the American section of the Circumpolar province; the endemic factor thus becomes $\frac{23}{31}$, or 75·4 per cent.—evidently a less natural result than $\frac{21}{24}$, or 87·5 per cent., the result in the table. If the Kurile-Kamstchatdale species be added to the Japanese, a total of 12 with an endemic factor of $\frac{41}{72}$, or 56·9 per cent., is obtained—again a less natural result than the $\frac{16}{24}$, or 66·6 per cent., of the table. If the species that occur in Arctic Siberia are considered along with those of the natural Siberio-Turkestan province, the total reached is 57, the total endemic 34. This gives an endemic factor of $\frac{34}{57}$, or 59·6 per cent.—again, as compared with the $\frac{32}{50}$, or 65 per cent., of the table, a less natural result. Finally, if the Arctic European species are added to those of the true European province, the total is raised to 43 without making any addition to the number of endemic species. This makes the endemic factor $\frac{33}{43}$, or 76·7 per cent.—most clearly a less natural result than that of table, which is $\frac{34}{40}$, or 85 per cent.

It is not necessary to discuss each of the provinces in such detail. One other example is sufficient to show how this reasoning may be extended to all the areas and to indicate the statistical tests that have in every case been applied. If the Caucasian species be added to the European, the conjoint total becomes 55, the endemic total 45, or no gain in numbers from the union. But the percentage for the whole area now becomes 81·8 in place of the 85·0 which it has been shown exists in the true European province. If they be added to the Siberio-Turkestan species, the total becomes 65, the endemic total 44, or only a gain of one on the whole area.[1] This gives a percentage of 67·6 in place of the percentage of 73·3 shown by the Caucasian province already. Finally, if they be added to the Himalayan species, a total of 116 with an endemic total of 101 results. This again causes no improvement over the whole area, but gives it a percentage of 87·0 in place of the 89·1 already shown to exist in the Himalayan province.

Besides this brief review of the general distribution of the genus, it is necessary to give a more detailed account of the distribution in the Himalayan province in which all the species described in this paper are found. Three very natural divisions are recognisable within it:—

1. The *Himalayan* division proper.—This includes on the west the Hindu-Kush and ends in the east at the valley through which the Sanpo passes to reach the Brahmaputra. It extends from 68° E. Long. to 95° E. Long., passes insensibly into the tableland of Tibet to the north, and is abruptly defined by the plains of India and the valley of Assam on the south. It contains 61 species, 43, or 70·5 per cent., of which are endemic.[2]

2. The *Indo-Chinese* division.—This extends from the Brahmaputra on the west to Hunan on the east, or between 95° E. Long. and 110° E. Long., and is somewhat abruptly separated from China Proper by the Yang-tse-kiang valley on the north, while it passes insensibly into the uplands of Assam and Burma on the south. It contains 47 species, of which 35, or 74·4 per cent., are endemic.

---

[1] Even this gain of one is doubtful, for (*cf.* Maxim., *Mel. Biol.* x, 120) it is not certain that the species in question (*P. achilleæfolia*) exists in both regions.

[2] This division of the Himalayan province is almost exactly equivalent to the Emodic or "Wallichian" region of Schöw's system of Phytogeography.

3. The *South Indian* division.—Small and isolated, this embraces Southern India and Ceylon, and contains two species which are both endemic.[1]

The facts are shown more succinctly in tabular form:—

TABLE VII.—*Distribution of Himalayan* Pediculares.

DIVISION.	Total number of species.	Number of species endemic.	Percentage endemic.
True Himalayan: Emodic (of Schöw)	61	43	70·5
Indo-Chinese	47	35	74·4
South Indian	2	2	100·

The EMODIC division of the Himalayan province admits of convenient subdivision at the valley of the Karnalli in Nepal into an eastern and a western half. This river, whose course almost exactly coincides with 81·5° E. Long. (a line midway between the eastern and western limits of the division), takes rise from the southern aspect of the ridge that parts the inner Himalayan waters that flow west to the Sutlej and Indus from those that flow east to the Sanpo and Brahmaputra. The western half contains 23 species, of which 7, or 30·4 per cent., are endemic. It contains, however, 3 others that extend from Persia, Turkestan or Tibet, but do not reach the eastern half, so that as against the latter the western contains 10, or 43·5 per cent., of peculiar species. The eastern half is twice as rich, yielding 49 species, of which 32, or 65·3 per cent., are endemic. There are 6 others that extend from Tibet or Indo-China without reaching the western half, so that as against the western the eastern half contains 38, or 77·5 per cent., of peculiar species. No such subdivision of the Indo-Chinese division is yet evident, although, as will presently appear, certain districts are distinctly discernible in it; nor is there any subdivision possible in the South Indian division, the most remarkable feature of which is that its species show greater affinities to Indo-Chinese than to Emodic (truly Himalayan) species.

In considering now the evidence as affecting the Himalayan districts, it must be recollected that too little is really known of Himalayan botany to admit of other than merely approximate results being stated. For while the Western Himalaya has, except for a limited area (Kafiristan) near the Indus, been fairly thoroughly investigated, the Eastern Himalaya, except for a very small section near the centre (Sikkim-Chumbi), is still unexplored.

The *Trans-Indus*[2] district comprises the Hindu-Kush and Karakoram (Mustagh) ranges with the highlands of Afghanistan. It is physiographically united to the Panjab Himalaya on the south-east, to the Kuen-lun (Chinese) on the east, to the Tianshan (Siberio-Turkestan) on the north, and much less distinctly to the Persian highlands on the west.

[1] It is necessary to point out here that in admitting this *South Indian Division* within the HIMALAYAN PROVINCE, the canon that regulates the recognition of provinces from statistics is violated. The annexation of the *Andean Division* to the AMERICAN PROVINCE is another instance of the same violation. It is indeed extremely probable that both South India and the Northern Andes are entitled to actual provincial rank, but the number of species they contain (two in the first case, one in the second) is so small that it is more convenient to treat them along with the nearest adjacent provinces, only calling attention in passing to the fact that the annexation is an intentional divergence from a rule that has everywhere else been rigidly observed.

[2] Trans-Indus from the Indian (not European) point of view.

It contains 13 species, of which none are endemic. Two species pass into Persia, six into Siberio-Turkestan, six into Tibeto-China, while all extend to the Panjab Himalaya. The facts are more easily presented in tabular form:—

TABLE VIII.—*Table of distribution for the Trans-Indus District.*

SPECIES.	Distributed to Persia.	To Siberio-Turkestan.	To Tibeto-China.	To Panjab Himalaya.
1. P. bicornuta	...	...	...	1
2. cheilanthifolia	...	1	1	1
3. dolichorrhiza	...	1	1	1
4. gracilis	...	...	...	1
5. longiflora	...	1	1	1
6. mollis	...	...	...	1
7. pectinata	...	...	...	1
8. pycnantha	1	1	...	1
9. pyramidata	...	...	...	1
10. rhinanthoides	...	1	1	1
11. siphonantha	1	...	1	1
12. tenuirostris	...	...	...	1
13. Oederi	...	1	1	1
Totals ...	2	6	6	13
Percentage ...	15·3	46·1	46·1	100·0

The district of the *Panjab Himalaya* comprises the country between the Indus and the Sutlej, and is physiographically joined to the Trans-Indus district on the north-west and north, to the Tibeto-Chinese province on the north-east, and to the Kamaon district on the east. It contains 20 species, of which 2 are endemic, 13 pass to the Trans-Indus district, 7 to the Tibeto-Chinese province, and 14 to Kamaon. Three Trans-Indus species reach this district, but do not extend to Kamaon, while 4 Kamaon species reach this district, but do not cross the Indus.

TABLE IX.—*Table of distribution for the Panjab Himalaya.*

SPECIES.	Endemic.	Trans-Indus.	Tibeto-Chinese.	Kamaon.
1. P. bicornuta	...	1	...	1
2. brevifolia	...	...	...	1
3. carnosa	...	...	...	1
4. cheilanthifolia	...	1	1	...
5. dolichorrhiza	...	1	1	...
6. elephantoides	1	...	...	...
7. gracilis	...	1	...	1
8. Heydei	1	...	...	...
9. longiflora	...	1	1	1
10. megalantha	...	...	...	1
11. mollis	...	1	...	1
12. pectinata	...	1	...	1
13. porrecta	...	...	...	1
14. pycnantha	...	1	..	...
15. pyramidata	...	1	...	...
16. rhinanthoides	...	1	1	1
17. Roylei	...	...	1	1
18. siphonantha	...	1	1	1
19. tenuirostris	...	1	...	1
20. Oederi	...	1	1	1
Totals ...	2	13	7	14
Percentage ...	10·0	65·0	35·0	70·0

The *Kamaon* district extends from the Sutlej to the Karnalli, passing into the Panjab Himalaya on the west, into Tibet on the north, and into Nepal on the east. It contains 17 species, of which 2 are endemic, 14 pass into the Panjab Himalaya, 5 into Tibet, and 7 into Nepal. There are, however, 5 others which, though not yet reported from Nepal, occur both in Kamaon and in Sikkim, so that altogether 12 species pass eastwards from the district. Three species that extend from the Panjab apparently do not go beyond Kamaon to the east—at all events they do not reach Sikkim. On the other hand, one Sikkim species reaches Kamaon without passing westward to the Panjab.

TABLE X.—*Table of distribution for the Kamaon Himalaya.*

SPECIES.	Endemic.	Panjab.	Tibet.	Nepal or Sikkim.
1. P. bicornuta	...	1	...	...
2. brevifolia	...	1	...	1
3. carnosa	...	1	...	1
4. gracilis	...	1	...	1
5. longiflora	...	1	1	(1)*
6. macrantha	1	...	...	...
7. megalantha	...	1	...	1
8. mollis	...	1	...	1
9. ophiocephala	1	...	...	...
10. pectinata	...	1	...	...
11. porrecta	...	1	...	(1)
12. rhinanthoides	...	1	1	(1)
13. Roylei	...	1	1	(1)
14. siphonantha	...	1	1	1
15. tenuirostris	...	1	...	...
16. trichoglossa	...	...	...	(1)
17. Oederi	...	1	1	1
Totals ...	2	14	5	12†
Percentage ...	11·7	82·3	28·4	70·5†

* The ( ) indicate that these species, although occurring in Sikkim as well as in Kamaon, have not yet been reported from the intermediate district of Nepal.

† The total in this case is that of all the Kamaon species that extend to the east, and on this the percentage is calculated.

The district of *Nepal* extends from the Karnalli to the Sikkim frontier. Its botany is only known from a few very partial collections: that of Dr. Hamilton, made in 1802-3, which is not Alpine, that of Dr. Wallich, made in 1821, and that of Dr. Scully, made in 1878. These two last are extremely local, and are mainly from the same place—the mountain of Gossain Than. Mr. Maries, who made a small temperate and sub-alpine collection in 1882, obtained no *Pedicularis*. In the three first collections only 10 species occur, none of which are endemic. Seven extend to Kamaon and eight to Sikkim, while only two extend to Tibet. The collections, however, are not calculated to throw much light on the relationship of the Himalaya to Tibet at this point. Two species extend here from Kamaon without reaching Sikkim; on the other hand, there are here three Sikkim species that do not extend west to Kamaon.

TABLE XI.—*Table of distribution for the Nepal Himalaya.*

SPECIES.	Endemic.	Kamaon.	Tibet.	Sikkim.
1. P. brevifolia	...	1	...	...
2. carnosa	...	1	...	1
3. furfuracea	...	...	...	1
4 gracilis	...	1	...	1
5. megalantha	...	1	...	1
6. mollis	...	1	...	1
7. Scullyana	...	...	...	1
8. siphonantha	...	1	1	1
9. Oederi	...	1	1	...
10 Wallichii	...	...	...	1
Totals ...	...	7	2	8
Percentage ...	...	70 0	20·0	80·0

The district of *Sikkim* is the only portion of the Eastern Himalaya that has as yet been thoroughly explored. It is particularly rich in *Pediculares*, probably as rich as any area of equal size in the whole Himalayan province. As here considered, the district consists of two portions—(*a*) *Sikkim Proper*, which admits of a simple practical definition as the drainage area of the river Tista and its tributaries, and (*β*) *Chumbi*, which is the valley next adjacent to Sikkim on the east, and which, though politically Tibetan, is geographically part of Bootan. It does not seem desirable to deal with this valley apart from Sikkim, for if treated by itself the districts are unduly multiplied, while if placed in the Bootan-Miri tract of the succeeding paragraph it gives a fictitious appearance of acquaintance with the Alpine Flora of that tract, of which in reality absolutely nothing is known. Moreover, if the use of the inductive method from the evidence afforded by the districts of the Western Himalaya is permissible, the hypothesis may be advanced that the Nepal district ends at the Arun river and does not reach the Sikkim frontier, while the Sikkim district, on the other hand, extends eastward to the Menas river and includes the whole political region of Bootan, and that another natural district exists between the Menas river and the Brahmakund. The evidence which the Chumbi valley species afford does not conflict with this hypothesis. Already 34 species have been reported from it, and of these 26, or 76·4 per cent., are also found in Sikkim. Since, however, those who consider Sikkim Proper a highly natural district may object to this hypothesis, in the subjoined table the species that occur in Sikkim and have not so far been reported from Chumbi, and *vice versâ*, are duly indicated. The number of species reported from the conjoint area is 48; of these 29 are endemic, 13 are known to extend westward and occur either in, or to the west of, Nepal, while 8 have already been reported from one or more of the districts to the east. The number of endemic species is very remarkable. At the same time it must

be recollected that the high percentage is largely due to the great increase in the total number of species as compared with any district to the west, and probably also to the wide extent of unexplored Himalaya lying between it and Yunnan, the only eastern district with which we are in a position to compare it. Indeed, the true significance of the figures in this table only becomes apparent when it is considered along with the similar table for Yunnan. Probably no such abrupt break as they seem to indicate exists anywhere in the Himalaya, and the reader is warned against construing them in this sense. If the table given below be consulted, it will be observed that there are in Sikkim Proper 40 species, of which only 8, or 20 per cent., are endemic, and in the Chumbi Valley 34, of which only 4, or 11·7 per cent., are endemic. This is in accordance with the evidence supplied by all the preceding districts, and probably indicates the condition of affairs throughout the entire province.

TABLE XII.—*Table of distribution for the Sikkim-Chumbi Himalaya.*

SPECIES.			Endemic.	Distributed west to or beyond Nepal.	To Tibeto-China.	East to or beyond Bootan.
1. P. alaschanica	...	(C.)	...	...	1	...
2. albiflora	...	(S.)	1	...	...	...
3. bella	...	...	1	...	...	...
4. carnosa	...	(S.)	...	1	...	1
5. chumbica	...	(C.)	1	...	...	...
6. Clarkei	...	...	1	...	...	...
7. collata	...	(S)	1	...	...	...
8. confertiflora	...	...	1	...	...	...
9. curvipes	...	(S.)	...	...	...	1
10. Daltoni	...	...	1	...	...	...
11. denudata	...	(S.)	1	...	...	...
12. Elwesii	...	...	...	...	...	1
13. excelsa	...	...	1	...	...	...
14. flagellaris	...	(S.)	...	...	...	1
15. flexuosa	...	...	1	...	...	...
16. furfuracea	...	...	...	1	...	...
17. Gammieana	...	(S.)	1	...	...	...
18. Garckeana	...	(C.)	1	...	...	...
19. gibbera	...	(S.)	1	...	...	...
20. globifera	...	...	1	...	...	...
21. gracilis	...	...	...	1	...	1

(C.) indicates that the species so marked occurs in the Chumbi valley but has not been reported yet from Sikkim;—(S), that the species appears in Sikkim and has not been so far reported from Chumbi.

TABLE XII.—*Table of distribution for the Sikkim-Chumbi Himalaya*—concluded.

SPECIES.		Endemic.	Distributed west to or beyond Nepal.	To Tibeto-China.	East to or beyond Bootan.
22. P. instar ... (S.)		1	...	...	...
23. integrifolia		1	...	...	...
24. Kingii ... (S.)		1	...	...	...
25. lachnoglossa		...	...	...	1
26. longiflora		...	1	1	...
27. lyrata ... (C.)		1	...	...	...
28. megalantha		...	1	...	...
29. microcalyx		1	...	...	...
30. mollis		...	1	...	...
31. nepalensis ... (S.)		1	...	...	...
32. odontophora		1	...	...	...
33. Oliveriana ... (C.)		1	...	...	...
34. Pantlingii		1	...	...	...
35. polygaloides		1	...	...	...
36. porrecta ... (C.)		...	1	...	1
37. Prainiana ... (C.)		1	...	...	...
38. Przewalskii ... (C)		...	...	1	...
39. Regeliana ... (S.)		1	...	...	...
40. rhinanthoides		...	1	1	1
41. robusta		1	...	...	...
42. Roylei		...	1	1	...
43. schizorrhyncha		1	...	...	...
44. Scullyana ... (S.)		...	1	...	...
45. siphonantha		...	1	1	...
46. tenuicaulis		1	...	...	...
47. trichoglossa		...	1	...	...
48. Wallichii ... (S.)		...	1	...	...
Totals ...		29	13	6	8
Percentage ...		60·4	27·0	12·5	16·6

(C.) indicates that the species so marked occurs in the Chumbi valley but has not been reported yet from Sikkim;—(S.), that the species appears in Sikkim and has not been so far reported from Chumbi.

The *Bootan-Miri* tract comprises what remains of the "Emodic" or Himalayan division proper to the east of the Chumbi Valley. Of its Alpine Flora nothing is known. From the outer ranges of Bootan one species has been received; this species (*P. gracilis*) is common to every district from Afghanistan to Yunnan.

Within the INDO-CHINESE division there are only half as many districts as there are in the Emodic division, and these districts, instead of forming a continuous series running from west to east, lie more or less parallel to each other and run north and south. It is to be expected from this arrangement that the northern portion of each of these districts will prove much richer in species of *Pedicularis* than the southern and therefore more tropical portion; and although it is as yet unfortunately impossible to compare them with each other as to the fulfilment of this expectation, since of the western and central districts only the southern portions are at all known, and of the eastern district only the northern part has been explored, the evidence from the division as a whole is in accordance with it.

The district of the *Assam-Burma uplands* lies between the rivers Brahmaputra and Irrawaday. It is organically connected at its northern extremity with the Eastern Himalaya on the one hand, and on the other with the succeeding Indo-Chinese district, and passing south-west diverges near the junction of its northern and middle thirds into two unequal branches, the shorter of which passes west, parallel to the Eastern Himalaya, to end in a *cul-de-sac* at the Khasia Hills, and the longer passes south to end in a similar *cul-de-sac* in the Yomadoung mountains of Arakan. This district has so far yielded 8 species, of which 2 are endemic, 4 extend westward to the true Himalaya, and 3 eastward to the other Indo-Chinese districts.

TABLE XIII.—*Table of distribution for the Assam-Burma uplands.*

SPECIES.	Endemic.	Extending to Himalaya Proper.	Extending to other Indo-Chinese districts.
1. P. carnosa	...	1	...
2. corymbosa	...	...	1
3. curvipes	...	1	...
4. flagellaris	...	1	...
5. fragilis	1	...	...
6. gracilis	...	1	1
7. rex	...	...	1
8. sp. nondum complete lecta	1	...	...
Totals ...	2	4	3
Percentage ...	25·0	50·0	37·5

The *Shan plateau* district lies between the Irrawaday and the Mekong rivers, is organically connected on the north with the two adjacent Indo-Chinese districts, and passes on the south into the Malay Peninsula: it has been so far very little investigated.

Six species have been reported, of which one is endemic, three pass westward to the Assam-Burma uplands, and four pass eastward to the Yunnan district.

TABLE XIV.—*Table of distribution for the Shan plateau.*

SPECIES.	Endemic.	To Assam-Burma uplands.	To Yunnan.
1. P. Collettii	1	...	...
2. comptoniæfolia	...	...	1
3. corymbosa	...	1	...
4. gracilis	...	1	1
5. gruina	...	...	1
6. rex	...	1	1
Totals ...	1	3	4
Percentage ...	16·6	50·0	66·6

The *Yunnan* district lies between the Mekong and the Yang-tse-kiang rivers, is organically united on its south-western border with the Shan plateau district, and passes on the north into the Chinese province. It comprises the Yunnan highlands with the connected ranges of Tonquin to the south-east and of Kwei-tschou to the east. It has already yielded 40 species, of which 28 are endemic, 9 extend westward to the other Indo-Chinese districts or to the Himalaya, 3 extend northward to China, and one (the identity of which is doubtful) appears to extend east to Japan.

TABLE XV.—*Table of distribution for the Yunnan highlands.*

SPECIES.	Endemic.	To Shan, Assam, or Himalaya.	To China.	To Japan.
1. P. Alopecuros	1	...	...	...
2. axillaris	1	...	...	...
3. brevifolia	...	1	...	...
4. cephalantha	1	...	...	...
5. comptoniæfolia	...	1	...	...
6. crenata	1	...	...	...
7. debilis	1	...	...	...
8. Delavayi	1	...	...	...
9. deltoidea	1	...	...	...
10. densispica	1	...	...	...

TABLE XV.—*Table of distribution for the Yunnan highlands*—concluded.

SPECIES.	Endemic.	To Shan, Assam or Himalaya.	To China.	To Japan.
11. P. Elwesii	...	1	...	...
12. Filicula	1	...	...	...
13. gracilis	...	1	...	...
14. gruina	...	1	...	...
15. gyrorrhyncha	1	...	...	...
16. lachnoglossa	...	1	...	...
17. likiangensis	1	...	...	...
18. lineata	1	...	...	...
19. longepetiolata	1	...	...	...
20. longicaulis	1	...	...	...
21. lutescens	1	...	...	...
22. melampyrifolia	1	...	...	...
23. microchila	1	...	...	...
24. oligantha	1	...	...	...
25. oxycarpa	1	...	...	...
26. polyphylla	1	...	...	...
27. porrecta	...	1	...	...
28. recurva	...	...	1	...
29. refracta	...	...	...	1
30. rex	...	1	...	...
31. rhinanthoides	...	1	1	...
32. rhodotricha	...	...	1	...
33. rigida	1	...	...	...
34. rupicola	1	...	...	...
35. sigmoidea	1	...	...	...
36. superba	1	...	...	...
37. tenuisecta	1	...	...	...
38. tschangchanensis	1	...	...	...
39. verbenæfolia	1	...	...	...
40. yunnanensis	1	..	...	...
Totals ...	28	9	3	1
Percentage ...	70·0	22 5	7·5	2·5

As in the case of the table for the Sikkim-Chumbi area, the endemic percentage in this has to be discounted. It is largely due to the high actual number of species and to the intervention of the unexplored tracts between it and Chumbi. The importance of the other figures is great. It is not unusual, perhaps owing to its political disposition, to treat Yunnan as botanically a district of the Tibeto-Chinese province. But on closer examination the *Alpine* Yunnan species at all events appear to be far more Himalayan than Chinese, and the evidence from *Pedicularis* completely accords with the view that Yunnan forms part of the Himalayan and not of the Tibeto-Chinese province. This is best seen by comparing Yunnan with each of these provinces. Three species from Yunnan appear in the Chinese province as above defined, while nine occur in other parts of the Himalayan province. Stated broadly, the figures indicate an affinity to the Himalayan province on the part of Yunnan thrice as great as its affinity to China. The evidence from comparison with adjacent districts is more emphatic still. The only Chinese district rich in Pedicularis that borders on Yunnan is Szetschuan. This district extends along the whole northern border of Yunnan, is of almost equal area, possesses very similar physical features, and has been about equally well investigated. The three Yunnan-Chinese species all occur here, two of them extending no further. But the Shan plateau district, which forms the south-west boundary of Yunnan and which has hardly been explored at all, has already been shown to share four species with Yunnan. Still more remarkable are the facts that the Sikkim-Chumbi area, which is separated by 540 miles of unexplored Alpine country, shares five species with Yunnan, and that another species, making six that pass from Yunnan to the Himalaya Proper, re-appears in Nepal and extends throughout the Western Himalaya as far as Kashmir.[1]

Equally conclusive is the evidence afforded by Szetschuan itself. This district has so far yielded 28 species, of which 9 are endemic, only 3 (as has been seen) extend to Yunnan, and only 4 to the rest of the Himalaya, while 11 extend to Tibet and Western Kansu and 10 extend to Eastern Kansu. These figures indicate with sufficient clearness that the cleavage line between the Chinese and the Himalayan provinces places *Alpine* Yunnan with the latter rather than with the former.

TABLE XVI.—*Table of distribution for the Szetschuan (Chinese) district.*

SPECIES.	Endemic.	To Yunnan.	To Himalaya Proper.	To Tibet and West Kansu.	To East Kansu.
1. P. anas	1	...	...	...	...
2. armata	...	...	...	1	...
3. bidentata	1	...	...	...	...
4. binaria	1	...	...	...	...
5. craspedotricha	1	...	...	...	...
6. cristata	1	...	...	...	...
7. Davidi	1	...	...	...	...
8. Franchetiana	1	...	...	...	...
9. ingens	1	...	...	...	...
10. kansuensis	...	...	...	1	1
11. lasiophrys	...	...	...	1	1

[1] The botanical evidence is in accord with the evidence afforded by the Entomology and Avi-fauna of Yunnan.

TABLE XVI.—*Table of distribution for the Szetschuan (Chinese) district*—concluded.

SPECIES.	Endemic.	To Yunnan.	To Himalaya Proper.	To Tibet and West Kansu.	To East Kansu.
12. P. longipes	1	...	...	...	...
13. macrosiphon	...	...	...	...	1
14. moupinensis	...	...	...	...	1
15. plicata	...	...	...	...	1
16. Przewalskii	...	...	1	1	...
17. recurva	...	1	...	...	...
18. rhinanthoides	...	1	1	1	1
19. rhodotricha	...	1	...	...	...
20. Roborowskii	...	...	...	1	...
21. Roylei	...	...	1	1	...
22. rudis	...	...	...	1	...
23. sima	...	...	...	1	1
24. siphonantha	...	...	1	...	...
25. szetschuanica	...	...	...	...	1
26. torta	...	...	...	...	1
27. tristis	...	...	...	1	...
28. verticillata	...	...	...	1	1
Totals ...	9	3	4	11	10
Percentage ...	32·1	10·7	14·2	39·2	35·7

The SOUTH INDIAN Division forms a single district composed of the Nilgiri Hills and the Western Ghauts along with the highlands of Ceylon, and contains, as has been said, only two species, both of which are endemic. One is restricted to Southern India, the other is found there and in Ceylon.

The South Indian district is poorer in species, therefore, than any of the Himalayan or Indo-Chinese districts. Of the Himalayan, the Western districts are evidently poorer than the Eastern. It is not, however, possible to say that the Indo-Chinese districts are poorer than the Eastern Himalayan, since the only districts that can at present be compared are Yunnan on the one hand and the Sikkim-Chumbi area on the other. But Yunnan, which in area more than seven times exceeds Sikkim and Chumbi, has as yet only yielded 40 species, as against 48 from the other district. It has to be recollected, however, that Yunnan has been by no means so thorcughly investigated as has Sikkim.

No portion of the Yunnan district falls within the political limits of British India, and the district is thus excluded from the scope of the descriptive part of this paper Nearly all its species are fully described and accurately figured in part vii of Mr. Maximowicz's *Diagnoses Plantaram Asiaticarum* contained in *Melanges Biologiques*, xii, 713 *et seq.* (1888), and to this very exact account of them the student is referred. As regards the other regions, it has seemed simpler to account for all the species that have hitherto been recorded from them than to confine the paper too pedantically within the area indicated by the political boundaries of the Indian Empire.

The table below shows compactly the physiographical and political constituents of each district with the names (arranged as far as possible chronologically) of the botanists to whose exertions their investigation is due:—

TABLE XVII.—*Conspectus of the Himalayan province.*

DIVISION.		DISTRICT.	Physiographical components.	Political components.	Botanical investigaters.
I.—TRUE HIMALAYA: Emodic Region of *Schow.*	*a.*—Western Himalaya.	1. TRANS-INDUS ...	Himalaya west of the river Indus: Karakoram (Mustagh) range: Hindu-Kush: Safed Koh.	[Kafiristan]: Badakshan: Baltistan: Kabul.	Griffith: T. Thomson: Stoliczka: Clarke: Collett: Aitchison: Giles.
		2. PANJAB HIMALAYA.	Himalaya between the Indus and the Sutlej rivers.	Hazara: Kashmir: Ladak: Lahul: Spiti: Kullu: Chamba.	Moorcroft: Jacquemont: Falconer: Edgeworth: Hay: Thomson: Stewart: Clark: Stoliczka: C. B. Clarke: Brandis: Duthie: Heyde: Ellis: Jaeschke.
		3. KAMAON HIMALAYA.	Himalaya between the Sutlej and the Karnalli rivers.	Sirmur: Kunawar: Garhwal: Tehri: Kamaon: [West Nepal partly].	Jacquemont: Wallich: Govan: Royle: Vicary: Strachey and Winterbottom: Thomson: Madden: Hoffmeister: Brandis: King: Schlich: Gamble: Duthie.
	b.—Eastern Himalaya.	4. NEPAL HIMALAYA.	Himalaya between the Karnalli and the Arun rivers.	Kingdom of Nepal except extreme west and extreme east. *Only a small portion of Central Nepal is investigated.*	Buchanan-Hamilton: Wallich: Scully: Maries.
		5. SIKKIM-BOOTAN HIMALAYA.	Himalaya between the Arun and the Menas rivers.	[East Nepal partly]: Sikkim: Chumbi: Phari: (Bootan).	Griffith: Hooker: Booth: Anderson: Clarke: King: Gamble.
		6. AKHA-MIRI HIMALAYA.	Himalaya between the Menas and the Dihong rivers.	[Akha]: (Daphla): [Miri]	Booth: King.
II.—INDO-CHINESE.		7. ASSAM-BURMESE UPLANDS.	The upland region between Brahmaputra and Irrawaday rivers, *i.e.*, Himalaya east of Dihong; Patkoi, Burail, Khasia, Khoondoung, Muni Pahar and Yomadoung ranges.	(Mishmi): (Patkoi): Burail: Khasia: Manipur: (Western Burma): [Lushai]: Chittagong: Arakan: [Kachen].	Wallich: Griffith: Masters: Hooker and Thomson: Simons: Oldham: Kurz: Clarke: Mann: King: Watt: Collett: Prain.
		8. SHAN PLATEAU	Upland region between Irrawaday and Mekong rivers, *i.e.*, Shan Hills and Pegu Yomah.	(South-west Yunnan): (Shan States): [Siam]: (Eastern Burma): Pegu.	Brandis: J. Anderson: Kurz: Collett.
		9. YUNNAN HIGHLANDS.	Upland region between the Mekong and the Yang-tse-kiang rivers, *i.e.*, Yunnan mountains, Tonquin hills and Nan-ling range.	Yunnan: (Kweitschou): (Tonquin) ...	Delavay: Perny.
III.—SOUTH INDIAN.		10. SOUTH INDIA...	Nilghiris; Western Ghauts: Ceylon Plateau.	South India: Ceylon	Koenig: Rottler: Roxburgh: Klein: Heyne: Perrottet: Schmidt: Wight: Beddome: Gamble: Burmann: Moon: Macrae: Walker: Champion: Gardner: Thwaites: Trimen.

[ ] indicate that this area is quite unexplored; ( ) indicate that this area has been only partially investigated.

In a very valuable contribution to Phytogeography[1] Mr. Hemsley has recently pointed out that a system of distribution based partly on existing and partly on anterior conditions must be unsatisfactory. He adds that the task of the biological geographer is completed when he has represented "as nearly as possible the main features of the distribution of existing animals" or plants.[2] The mechanical portion of the task truly ends here; the philosophical aspect of the problem only then presents itself. In the case of *Pedicularis* the physiographical features and meteorological conditions of the northern hemisphere may explain how it is that the genus is localised in a series of provinces characterising the *Arctic-Alpine* northern flora. But how the delimitation is effected is of less interest than why the delimitation is possible. The differential effects of physical conditions being so great that resultant areas are expressible in terms of their endemic species, how is it that the presence of one genus in the several areas is explicable? To satisfy this enquiry reference to anterior conditions seems to be essential.

[1] Godman and Salvin: *Biologia Centrali-Americana; Botany, Introd.* (1888).

[2] Hemsley *l.c.* xxix, xxx. The passage quoted is part of a passage taken by Mr. Hemsley from Mr. Wallace's work on the *Geographical Distribution of Animals* i, p. 55.

The present distribution of the Arctic-Alpine flora is usually explained on an hypothesis of alternating migrations.[1] This hyphothesis may be summarised as follows:—

A circumpolar flora initially uniform in character and, during the warmer period antecedent to one or other of the more general glacial periods, compact in distribution, commenced to migrate southwards under the influence of the gradual decrease of temperature that preceded the glacial period proper. During this advance new forms that appeared did so under conditions that were uniform for the migrating flora. At the same time the progressive enlargement of the area subject to these conditions mitigated the severity of the struggle for existence between rival forms and diminished the swamping effect of the presence alongside of them of the original types. A large proportion of the forms were thus enabled to survive. Here and there accident determined the detention of stragglers, while occasionally a particular meridian of migration ended in a *cul-de-sac*. In these cases necessity compelled the development of a power of accommodating themselves to circumstances which proved sufficient in a few forms to ensure their survival. Wide seas and lofty mountain chains on whose summits a rigorous climate had already become established formed natural obstacles to the advance, and where these were encountered the advance was checked or deflected. Elsewhere the line of furthest advance formed a continuous zone of distribution. The transition between congeneric forms in a given section of this zone was a serial one and represented the evolution of the genus along one meridian of migration; the transition between forms of successive adjacent meridian-sections was in a closed curve. The natural conditions uniform for the invading flora were progressively unfavourable for the displaced one, and few of the forms characteristic of the latter were able to accommodate themselves to adverse circumstances and at the same time to hold their own against members of an invading flora for which these conditions were suited.

When the advance ceased there ensued a period during which the natural conditions were comparatively stable. The struggle for existence within the invading flora was therefore intensified, since the number of forms continued to increase while the area they inhabited ceased to enlarge. Internal pressure tended to make the invading flora extend to localities less favourable for its existence. But in these localities the conditions were favourable for the displaced flora, and here it was able not only to survive, but to resist invasion. Hard pressed from within, successfully opposed from without, many forms gave way in the struggle, and as here one, there another, kind of variation proved more adapted to local conditions, some local colouring became imparted to different districts of the zone in which the Arctic-Alpine flora now lived.

This period of stability came also to an end. With the gradual increase of temperature that marked the disappearance of the ice, the invading flora began to migrate northwards. Like the advance, the retreat was a meridional one modified by local conditions. Intervening seas checked or deflected it as they did the advance. Mountain ranges, however, played a different part. In place of turning aside the retreating flora they largely attracted it, offering their flanks as routes of safe retreat and their summits as asylums where retreat was altogether cut off. But even with this the area available for the Arctic-Alpine flora was steadily curtailed, the struggle for existence was intensified, the tendency to vary, especially in districts where retreat was delayed, was greatly stimulated, the variations deviated more and more from the original type, while for reasons that are not yet demonstrable, now more, now fewer, forms survived.

[1] This theory was first advanced by Professor E. Forbes (*Brit Assoc. Report*, 1845, and *Mem. Geol. Survey* i, 336-432 1846), but was greatly extended and elaborated by the late Mr. Darwin (*Origin of Species*, chap. xi [edit. 6, chap. xii]), and specially applied by Sir J. D. Hooker (*Trans. Linn Soc.* xxiii, 253).

The mountains to the north of the zone of furthest advance were not alone in attracting the retreating flora. To a less but still to an appreciable extent certain forms found an asylum and perhaps a base for further advance on the slopes or summits of mountains to the south.

During the retreat the local colouring peculiar to forms of a particular area became imparted to all the districts along the meridian of retreat In this way the circumpolar flora of the second period of stability, while as compact in distribution as the initial one had been, was less uniform in character. On the other hand, mountain systems that had during the advance formed impassable barriers between adjacent meridians of migration, attracted to their opposite flanks during the retreat the forms they had hitherto kept asunder, and permitted through their passes an interchange of influence and of individuals. Individuals agreeing in morphological characters did not all regain the original seat of the flora, but were content or were compelled to remain in one or more of the Alpine localities *en route*. Their characters these detained individuals at first transmitted unchanged. But when the period of retreat had ceased, there came a time when natural conditions were once more stable. And now even in the most suitable localities slight modifications ensued, while in localities where retreat had been earliest and most completely cut off, this period of stability allowed the retreating flora to develope its latent powers of accommodation and permitted the survival of forms that must otherwise have altogether disappeared. But the somewhat unsuitable conditions of these localities greatly stimulated the tendency to vary, the more suitable varieties surviving and supplanting the original types. This went on till a balance was established and a period (of which the present is probably an example) of approximate equilibrium resulted. This equilibrium was earliest attained in the new circumpolar region, where the natural conditions were those that had characterised the true home of the flora, whatever its geographical position and whether in advance or in retreat. Its greatly circumscribed area caused an enormous reduction in the number of the forms it contained, but owing to continuity of conditions there were necessarily among the survivors fewer variations from the original types, and these variations were slight. It is thus that in general terms the Circumpolar province is poorer in number of forms, that these forms are generally more archaic in structure and the endemic percentage of its separable forms is lower than in other provinces, while in provinces nearer to the circumpolar, as compared with those more remote, the same things hold good.

The behaviour of the Equatorial Flora during these alternating migrations has only an indirect bearing on the distribution of the particular genus under review. It need therefore be but briefly alluded to. It was of necessity in all points the opposite of the other—while the Circumpolar flora advanced and was characterised by a zonal distribution, the Equatorial retreated and had a meridional character imparted to its distribution; while, on the other hand, the Circumpolar flora retreated, the Equatorial advanced, and its mode of distribution became necessarily more zonal. It has been pointed out on a former page that a few forms of *Pedicularis* are present in the Intermediate Flora.[1] But Sir J. D. Hooker has clearly shown[2] that there are in reality only two Floras. These two are the Circumpolar and the Equatorial; and this Intermediate Flora, which it is convenient to recognise *in practice* since it simplifies the treatment of the other two, has been composed mainly of forms left behind by the Equatorial when the Circumpolar was advancing, by the Circumpolar itself when it was retreating. According to the hypothesis of migrations the present period is one of approximate equilibrium subsequent to a Circumpolar retreat;

[1] P. 22.

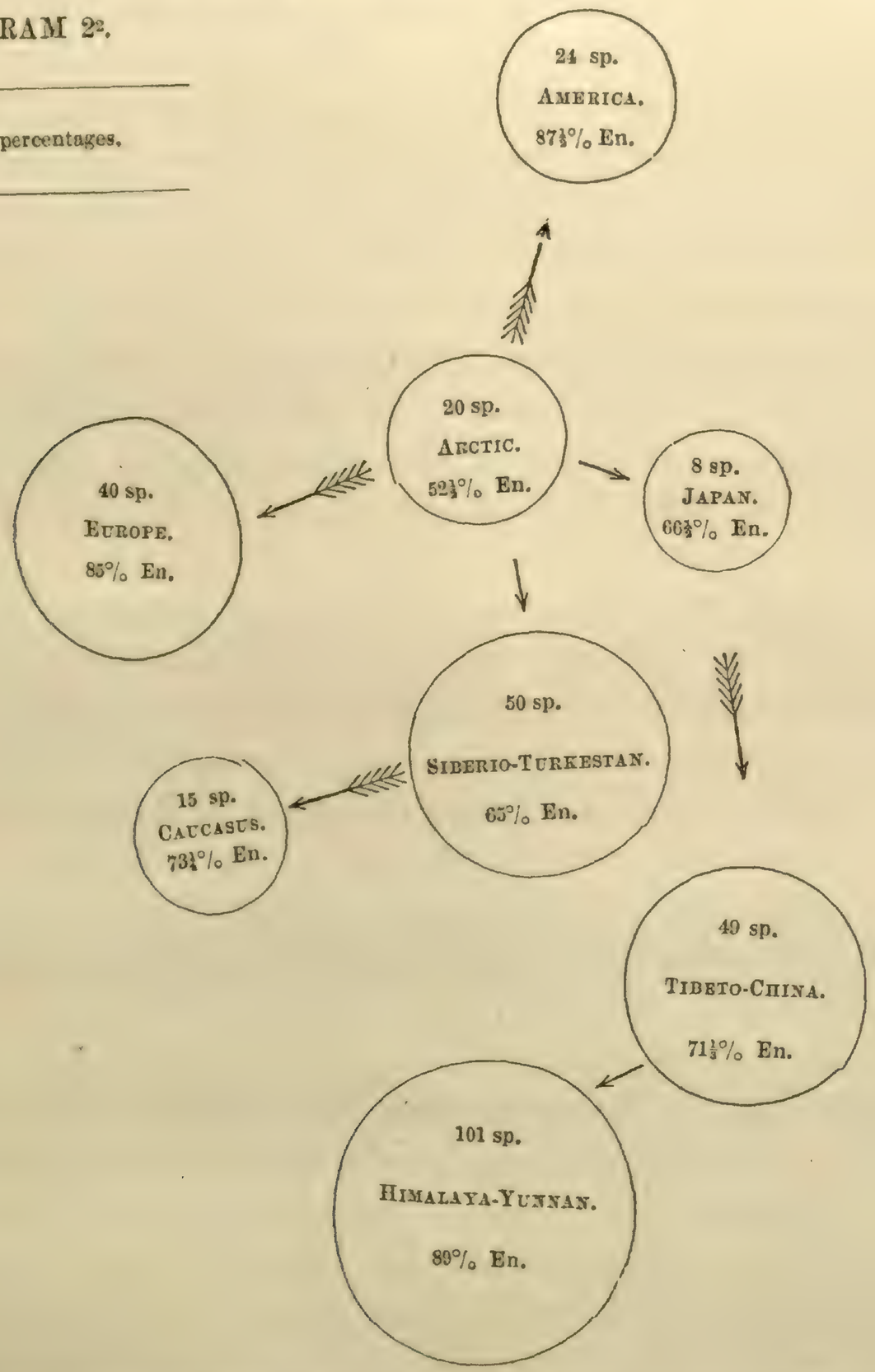
[2] Godman and Salvin: *Biologia Centrali-Americana: Botany; Commentary on Mr. Hemsley's Introduction*, p. lxv.

the forms characteristic of the present *Intermediate* Flora should therefore be largely of Circumpolar type. As, however, the natural conditions to which they have been subjected are such as pass into those favourable for an advance of the Equatorial Flora, a tendency to the zonal distribution characteristic of an advancing flora has been imparted to it.[1] Briefly stated, the condition of affairs has always been this:—the constituents of the *Intermediate* Flora during each period of approximate equilibrium have been mainly derivates of the flora that retreated during the migration immediately preceding in distribution parallel to the constituents of the flora that advanced during the same time.

The general agreement of the distribution of *Pedicularis* with this hypothesis becomes very evident when table VI given above (p. 25) is replaced by a diagram in which the endemic percentages are shown:—

DIAGRAM 2[2].

Endemic percentages.



[1] If the hypothesis be correct, the forms characteristic of the Southern Intermediate Flora should evidence their residual character by being of Equatorial type, and as physiographical circumstances have protected them from pressure on the part of an advancing southern Circumpolar Flora during the most recent migration, their forms should exhibit a meridional rather than a zonal distribution. We should expect, for instance, to find in South Africa that lateral distribution—*e.g.* the appearance of the same species in Western Cape Colony and in Natal—is a somewhat exceptional phenomenon. This does not, however, affect the constitution of the genus under discussion.

[2] This diagram and the nine that succeed it are uniform and have been constructed on the following principle:—The centre of the circle that represents the Arctic province coincides with the North Pole, while the centre of each of the other circles coincides with the centre of area on a map of the Northern Hemisphere of each of the individual provinces; the area of each circle is at the same time in direct proportion to the total number of species of *Pedicularis* reported from the province that the circle represents—an arbitrary area being of course chosen for one province, the others being made to conform to the first.

This diagram appears to prove—

(1) that there are four meridians of distribution passing from the Circumpolar province to the American, European, Siberian, and Japanese provinces respectively;[1]

(2) that there is no extension of the American or European meridians; and

(3) that the Siberian meridian is projected into the Caucasus.

At the same time it leaves it doubtful—

(1) whether the Tibeto-Chinese province may be a projection of the Japanese meridian of distribution or be due to a bifurcation of the Siberian meridian within that province; and

(2) whether the Himalaya-Yunnan province may be a projection of the Tibeto-Chinese meridian (whatever its derivation) or be a projection of the meridian of distribution through the Caucasus.

But as these points of dubiety only raise questions of possible alternative interpretation and do not assail the truth of the general position, we are at liberty to proceed at once to a consideration of the special evidence from structure and, in indicating how far it is corroborative of the general arithmetical evidence, to note at what points and in what direction these doubtful problems are solved.

---

[1] The reader will bear in mind that Sir J. D. Hooker (*Trans. Linn. Soc.* xxiii) has shown the possibility of there having been a meridian of distribution along Greenland, and that this meridian, at all events during the last southward migration, may have terminated in the *cul-de-sac* which its present physiography would suggest. The morphological evidence of *Pedicularis* having already declared the whole of Greenland to be at present circumpolar is not available as a test of this. Sir J. D. Hooker has also shewn in the same place that the flora of Greenland has very much greater Lapponic than American affinities, while Baffin Bay and Davis Strait indicate a sharper cleavage line than the ocean between East Greenland and Norway. It is interesting to observe that, so far as the evidence from *Pedicularis* is concerned, there is, in spite of the present continuity of Arctic-Alpine conditions, as sharp a cleavage between America as a whole and Alaska, for of the twelve Alaskan species, only two—*P. euphrasioides* and *P. palustris*—pass to America, while the significance of this distribution is extremely slight since both these species are examples, as their zonal distribution testifies, of the *Temperate-Intermediate* and not of the *Arctic-Alpine* Circumpolar Flora. This cleavage is confirmed by the evidence of *P. sudetica*, which on the European and on the Siberian meridians of distribution remains undistinguishable from the Arctic plant, but has on the American meridian been modified into a perfectly distinct, although still representative species, *P. scopulorum*. Besides the negative evidence as regards the American meridian, there is positive evidence as regards the adjacent Japan-China-Himalaya meridian. One species (*P. Chamissonis*) is confined to this meridian, extending along it to Japan. Two others—*P. verticillata* and *P. Oederi*—appear in Northern China. At the same time one of the endemic species, *P. pedicillata*, has its nearest allies in Chinese and European species, and the other, *P. Menziesii*, is (like *P. verticillata*) distinctly separated from all the species of the American meridian by its character of opposite leaves—a character which does not occur among American species proper, but is, on the other hand, highly characteristic of the Japan-China meridian.

The cleavage between Alaska and Greenland pointed out by Sir J. D. Hooker is strikingly verified by the evidence from this genus. While ten Alaskan species, or 83⅓ per cent., occur in Arctic Asia, only three (*P. euphrasioides*, *P. hirsuta*, and *P. lanata*), or 25 per cent., occur in Greenland. The evidence of *P. euphrasioides* has to be discounted, and though there is no evidence that the extension is not direct in both the other cases, there is proof in one case that it need not be. For while *P. lanata* is confined to Eastern Arctic Asia, Alaska, and Greenland, *P. hirsuta* extends from Alaska through the whole of Arctic Asia and Europe to Lapland, and it may well be in this direction that its extension into Greenland is to be sought for.

But while the cleavage between Greenland and Alaska is thus borne out, the genus affords no evidence of a cleavage between Greenland and the rest of America. It appears on the contrary to indicate that the American province and Greenland are on the same meridian of distribution. For while of the six species that occur in Greenland, three (*P. hirsuta*, *P. lapponica*, and *P. flammea*), or 50 per cent., extend to Lapland, and three (*P. hirsuta*, *P. lanata*, and *P. euphrasioides*), or 50 per cent., to Alaska, four, or 66⅔ per cent., pass across Davis Strait: two of these indeed (*P. flammea* and *P. lapponica*) no further than to Labrador, thus remaining circumpolar, but the other two (*P. euphrasioides* and *P. groenlandica*) into the American

The highest kind of morphological evidence is, as we have already seen, that derived from the structure of the corolla. It has been seen that Orthorrhynchous and Siphonanthous corollas, while negativing the suggestion of a progressive development the one from the other, agree in indicating a development of both from corollas of Rhyncholophous type. It has also been seen that many natural groups exhibit the transition from Rhyncholophous to Anodontous corollas, and that there is strong presumptive evidence of the independent evolution of Bidentate from Anodontous corollas. We are thus led to the conclusion that among the Anodontous corollas we see the most archaic types exhibited by the genus at the present time.

It is clear from the difficulty that has been experienced in classification that no very natural sections exist in the genus. In the meantime therefore it is necessary to waive a consideration of the distribution by these. But fortunately the very natural and fundamental character on which classification is founded—the absence or presence of a beak on the corolla—and which divides the genus as a whole into two almost equal

---

province. The evidence of *P. euphrasioides*, as already said, has to be discounted. It is a Temperate rather than an Arctic-Alpine species, and exhibits the zonal distribution characterising such species. But the evidence of *P. groenlandica* is very direct, for it is clearly not a species that has been evolved in Greenland, but one that has extended thither during the return of the circumpolar flora. In the first place, it is the most highly specialised of all the Arctic species, and belongs indeed to the *Surrectæ*, the most highly specialised and most characteristically American group of the RHYNCHOLOPHÆ. Then the remaining members of this group (*P. incurva*—Andes of Colombia and *P. attollens*—California) are endemic in America and absolutely extra-Arctic, while their nearest ally (*P. excelsa*) is endemic in the Himalaya and is also extra-Arctic. Finally, *P. groenlandica* itself is not peculiar to Greenland, but extends thither northwards from New Mexico and California through the Rocky Mountains, Rupert's Land, and Labrador. The annexed tables more fully explain this note :—

TABLE XVIII.—*Comparison of distribution for Alaska and Greenland.*

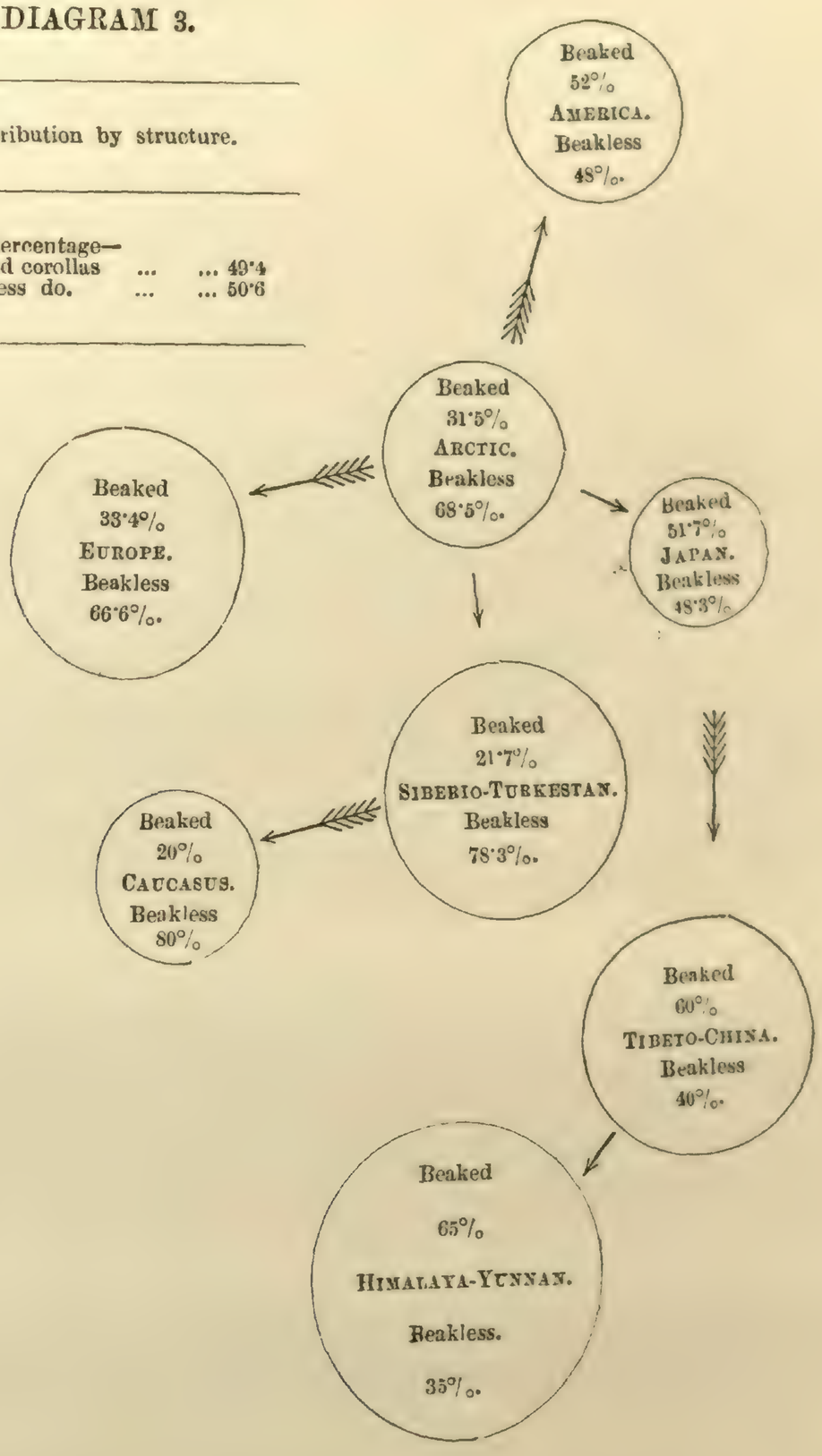
ALASKA.					GREENLAND.			
Species.	Endemic.	To America.	To Greenland.	To Arctic Siberia.		To America.	To Alaska.	To Lapland.
1. P. Menziesii ...	1	...	...	...	1. P. hirsuta ...	...	1	1
2. verticillata ...	...	...	...	1	2. lanata ...	...	1	...
3. Oederi ...	...	...	...	1	3. euphrasioides	1	1	...
4. hirsuta ...	...	...	1	1	4. lapponica ...	1	...	1
5. lanata ...	...	...	1	1	5. flammea ...	1	...	1
6. Langsdorfii ...	...	...	...	1	6. groenlandica	1	...	...
7. capitata ...	...	...	...	1				
8. Chamissonis ...	...	...	...	1				
9. euphrasioides	...	1	1	1				
10. palustris ...	...	1	...	1				
11. sudetica ...	...	...	...	1				
12. pedicellata ...	1	...	...	...				
Totals ...	2	2	3	10	Totals ...	4	3	3
Percentages ...	16·6	16·6	25·0	83·3	Percentages ...	66·6	50·0	50·0

parts, lends itself readily for purposes of comparison. Its evidence is again best appreciated when exhibited diagrammatically:—

DIAGRAM 3.

Distribution by structure.

General percentage—
Beaked corollas ... ... 49·4
Beakless do. ... ... 50·6



Structure thus directly confirms the evidence from endemic percentage as regards the Japanese, the American, and the European meridians of distribution, while curiously it inversely, but still equally completely, confirms the evidence from endemic percentage as regards the Siberian; whereas along the other three meridians the percentage of corollas of archaic type gradually falls towards their equatorial limits, along the Siberian meridian it actually increases. This exceptional arrangement affords on the one hand strong confirmation of the already almost conclusive evidence that the Caucasus is a projection of the Siberian meridian, and on the other makes it almost impossible either that the meridian of distribution for China is derived from that of Siberia, or that the meridian for the Himalaya is extended from that of the Caucasus. At the same time there is direct evidence that the meridian of Japan is projected into China and extends thence to the Himalaya.

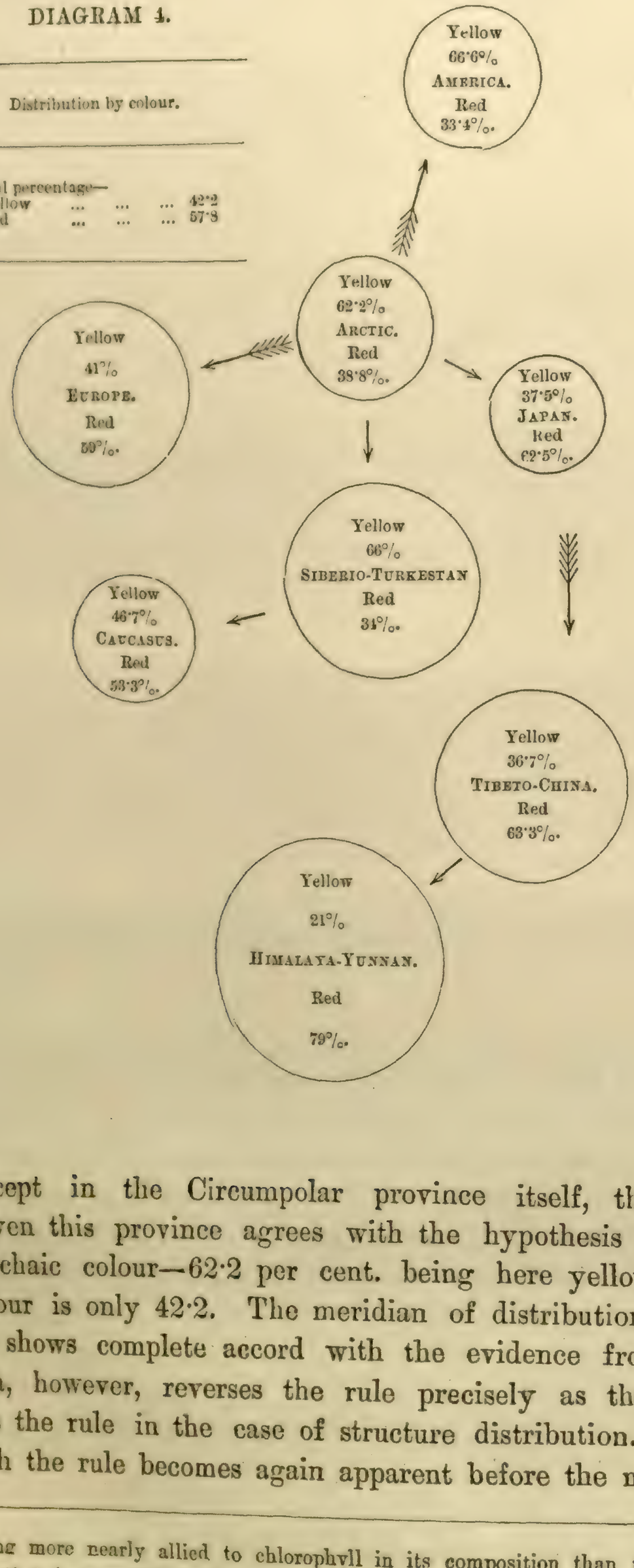
Another character that admits of comparative use is colour. As already explained, there are practically two colours in the genus—yellow and red. Yellow being perhaps

chemico-physically the more archaic[1] might be expected to show a general correlation to structure of the more archaic type. It has, however, been seen that the exceptions in both directions are too numerous to admit of colour and structure being considered conjointly: it becomes necessary therefore to consider the general evidence from colour distribution by itself. As before, the simplest method of presentation is by diagram:—

DIAGRAM 4.

Distribution by colour.

General percentage—
Yellow ... ... 42·2
Red ... ... 57·8



Except in the Circumpolar province itself, the evidence is clear and distinct, while even this province agrees with the hypothesis in having a predominance of the more archaic colour—62·2 per cent. being here yellow, while the general percentage of this colour is only 42·2. The meridian of distribution for Europe, as well as that for Japan, shows complete accord with the evidence from endemic percentage. That for America, however, reverses the rule precisely as that for Siberia and the Caucasus reverses the rule in the case of structure distribution. So at first does that for Siberia, although the rule becomes again apparent before the meridian reaches the Caucasus.

[1] Being more nearly allied to chlorophyll in its composition than the other, and thus more closely related to a substance that is essential in the economy of phanerogamous plants.

The Japan-China-Himalaya meridian of distribution exhibits the most striking predominance of red throughout, and it deserves to be noted that if the species *endemic in the two Arctic peninsulas*[1] *that project towards this meridian* be subtracted from the rest of the Arctic species, the circumpolar colour percentage becomes—yellow, 66·7; red, 33·3, —a result in accordance with the evidence from endemic percentage and structure alike.

The predominance of red, so marked along the Japan meridian even from within the Circumpolar province, and culminating in the Himalaya in the overwhelming proportion of 79 red to 21 yellow, has some striking features within the last-named province. In the West Himalayan division (Trans-Indus, Panjab Himalaya, and Kamaon districts) —where there are altogether only 23 species—9, or 39 per cent., are yellow. This is in marked agreement with the percentage for Tibeto-China, the slight preponderance of yellow over the average Chinese percentage being perhaps due to the influence of the adjacent meridian of distribution. In the Eastern Division (Nepal, Sikkim, and Chumbi) there are 50 species, of which only 8, or 16 per cent., are yellow, while in the Indo-Chinese division (Assam, Burma, Yunnan) there are 47 species, of which 5, or only 10·8 per cent., are yellow. The condition along this meridian is thus more striking and more uniform than even the diagram indicates.

One other general character—that of phyllotaxis—remains to be considered. We have seen that the leaves in this genus may be alternate or may be opposite, and although, for reasons which have been already explained, the use of this character in a primary subdivision of the genus has been abandoned, the character is nevertheless a highly natural one.

There is the same difficulty in estimating the value of the character here as there was in using it for purposes of classification. It affords from internal evidence no clue to its own evolutionary history. We are unable to gather *from morphology* whether the alternate-leaved or the opposite-leaved condition is the more archaic.

The alternate-leaved condition prevails, as we have seen, in the proportion (roughly) of 65 : 35. But we have seen also that its general relationship to structure is one of indifference, and we know that of the Tribe EUPHRASIEÆ, to which the genus belongs, and of which it certainly does not exhibit the most archaic type of corolla, an opposite-leaved condition is highly characteristic. Its relation to structure in particular sections is not more instructive. If the SIPHONANTHÆ—"nobilissimæ et omnibus reliquis anteponendæ"[2]—are alternate-leaved, the ORTHORRHYNCHÆ, which contend with these for the hegemony of the genus, are as characteristically opposite-leaved. RHYNCHOLOPHÆ are mostly alternate-leaved, it is true, but there are some of the groups that were included in the abandoned "Verticillatæ" that have Rhyncholophous corollas. Then BIDENTATÆ, of which till quite recently alternate-leaves were supposed to be characteristic, are not only being reported in constantly increasing numbers from the Eastern Himalayan divisions with opposite leaves, but the highest degree of specialisation on this particular line of evolution (shown by the *Lyratæ*) is concomitant with the possession of opposite leaves. As regards ANODONTÆ, which exhibit the most archaic types of corolla, the balance is in favour of opposite leaves, the proportion of these to alternate being at present 35 : 27, but the evidence is too slight to be conclusive.

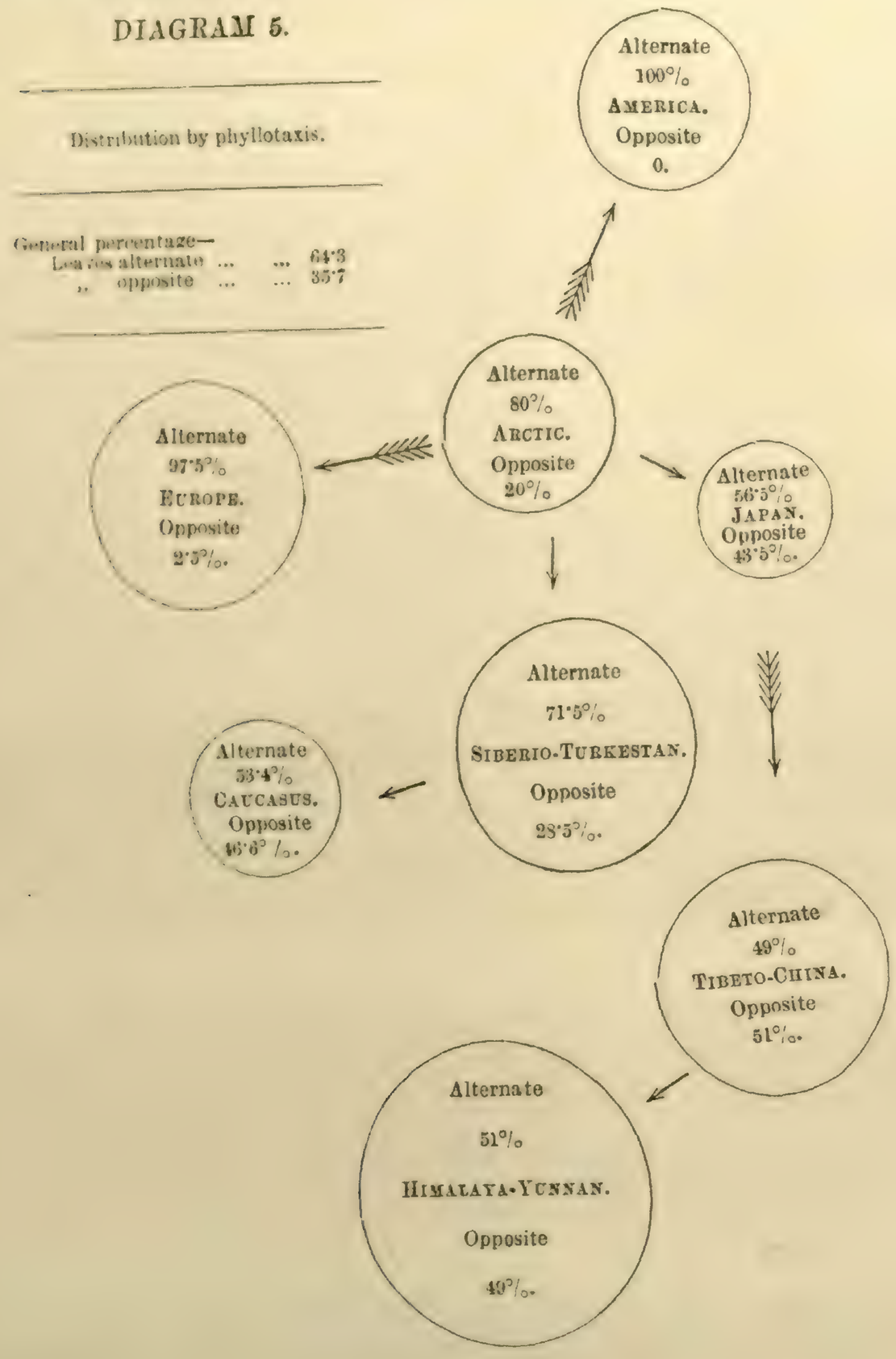
The following diagram on this account affords no assistance in considering the question of general distribution. In this case indeed the evidence obtained elsewhere is required to explain the character that the diagram illustrates. In details, however, and as regards

[1] *P. nasuta* in Kamstchatka and *P. pedicellata* in Alaska and Sitka Island, both of which are without close structural allies elsewhere in the Circumpolar Flora and both of which have red corollas.

[2] Maximowicz, *Mel. Biol.* xii, 778.

particular meridians of distribution, the evidence is in accordance with that derived from other sources:—

DIAGRAM 5.



The most notable features of this diagram are—

(1) the absence of opposite-leaved species along the American and European meridians. In America Proper there are no opposite-leaved species: in Europe only one (*P. verticillata*);

(2) the progressive increase in the percentage of opposite-leaved species along the Siberian meridian of distribution; and

(3) the practical equilibrium of the percentage from end to end of the Japan-Himalaya meridian.

While these facts strikingly confirm the evidence already advanced in support of the hypothesis of meridional migration, they throw some light on the evolution of the character in question and on the history of the genus. The lower percentage of opposite-leaved species in the Circumpolar province appears to favour the hypothesis that the genus was at first characterised by alternate leaves only. It is scarcely possible otherwise to suppose that the original circumpolar flora was uniform, and to account for the absence of opposite-leaved forms from the American meridian. On the other hand, the absence of such forms

from America sufficiently explains their absence from Labrador and Greenland, the arctic districts into which its meridian of distribution passes. If, on the other hand, we suppose that the character first made its appearance in the Japan-Himalaya meridian, throughout which the number of opposite-leaved species almost equals the number of alternate-leaved ones, we explain at once the fact that we meet in the two arctic districts—Kamstchatka and Alaska—into which this meridian passes, all the four verticillate circumpolar species, as well as the fact that two of these (*P. Menziesii* and *P. Chamissonis*) are confined to these districts. Of the others, *P. amœna* extends westward as far only as the Yenisei, *P. verticillata* extends westward into Lapland. It is probable that the character was evolved during some period of southward migration anterior to the most recent one, and that *P. verticillata* and *P. amœna*, or some closely representative species, reached the circumpolar province during the northward migration that followed. The intra-arctic cleavage between Alaska and Greenland is, from the evidence adduced by Sir J. D. Hooker,[1] of a high antiquity, so that only a westward zonal distribution was open to them. But they had not extended equally far when the succeeding southward migration commenced, hence it happens that while *P. verticillata* and *P. amœna*[2] have both migrated along the Siberian meridian of distribution, *P. verticillata* alone, having by the same time extended sufficiently far west, has migrated along the European meridian of distribution also. Why *P. amœna* should have proved unstable in its meridian of distribution (*P. violascens* is evidently an immediate derivate), while there and in Europe *P. verticillata* has remained unchanged, also why in the Himalo-Chinese meridian *P. verticillata* itself has been unstable (*P. refracta* and *P. szetschuanica* being clearly immediately derived forms), are problems which it would be premature in the present state of our knowledge to attack. But the facts are nevertheless very striking.

The considerable number of opposite-leaved forms on the Siberio-Caucasus meridian is to some extent capable of explanation on the assumption that the character was evolved in the adjacent Himalo-Chinese meridian without necessarily postulating a retreat for all the characteristic forms as far as the present Circumpolar province. For during periods of stability marking the line of furthest advance, opposite-leaved species extended zonally westward to what is now the Caucasus province. Eastward they either did not extend, or, if they did, the tracts into which they passed are now submerged. Westward beyond the Siberio-Caucasus meridian their extension was checked by an ancient Aralo-Caspian northward projection of that Mediterranean Ocean which in early Tertiary times separated part of India from the rest of Asia, and extended westward to Europe. During periods of retreat, too, many forms were attracted from the Himalo-Chinese meridian to the southern and eastern flanks of the extended mountain system, which in times of advance had delimited the Siberian and the Chinese meridians, but had now, owing to changed physical conditions, become the backbone of the former. As time went on these forms overflowed, through its passes, what had been at first their barrier wall, and commingled with forms that had been similarly attracted to the northern and western flanks of the same system from the Siberian plains.

The northern shores of the Early Tertiary Mediterranean Ocean prevented the extension of the genus southward beyond the present limits of the European and the Caucasian

[1] *Trans. Linn. Soc.* vol. xxiii, p. 252.

[2] *P. verticillata* extends in Europe from Spain (Sierra Nevada) to the Balkan Peninsula (Rumelia), along the Siberian meridian from Okotsk through Baikalia to the Altai range, along the Chinese meridian to Szetschuan; *P. amœna* is confined to the Siberian meridian, and extends from Okotsk through Baikalia and the Altai range to the Alatau mountains.

MISSOURI BOTANICAL GARDEN

meridians, while the elevated land that Mr. Wallace has suggested as existing in later Tertiary times where the northern part of the Bay of Bengal now is,[1] enabled an extension of the Himalo-Chinese meridian to take place towards the end of the last period of stability, or perhaps even at the beginning of the last period of retreat, into Southern India. The fact that the South Indian species are so few curiously confirms the idea that it was not in existence during earlier times. And equally striking are the facts that one of the species (*P. zeylanica*) is a member of a highly natural group of forms the rest of which have their seat in the Indo-Chinese division, while the other (*P. Perrottetii*) has its nearest allies in two Kansu and Szetschuan species (*P. macrosiphon*, *muscicola*); for Mr. Wallace's suggestion is made in order to explain how "a few Malayan types may have migrated to the Peninsula of India and have been preserved only in Ceylon and the Nilgheries," and these two species of *Pedicularis* show how equally applicable it is in explaining the presence of a few members of an Arctic-Alpine genus.

That zonal distribution was at some time possible between the southern ends of the European and Siberio-Caucasus meridians is perhaps evidenced by the existence in Asia Minor of *P. comosa*. But the evidence is inconclusive since *P. comosa* extends far along the Siberian meridian, and may have thus a polar derivation. Equally inconclusive is the evidence afforded by the existence of forms so closely allied as *P. acaulis* and *P. Regeliana* or as *P. asplenifolia* and *P. albiflora* in the European Alps and in the Himalayas respectively. For, as regards the former two, we find an intermediate form in North China, that is, on the Himalayan meridian, but nearer the Circumpolar province; as regards the latter two, we find an allied form (*P. pedicellata*) within the Circumpolar province now. The latter fact equally invalidates the evidence from *P. rostrata* (European) and *P. Nordmanniana* (Caucasus).[2] It should be noted in passing that the two South Indian species just dealt with are both examples of species with corollas somewhat highly specialised in most respects (that of *P. zeylanica* being of Rhyncholophous, that of *P. Perrottetii* even of Siphonanthous type), and yet that both are beakless. They thus appear to afford strong confirmation of the general evidence from morphology that the appearance of a beak to the corolla was a phenomenon of comparatively recent occurrence—that beakless corollas are the more archaic.

That zonal distribution once took place between the southern ends of the American and the Himalo-Chinese meridians appears possible from the fact that the members of the most highly specialised American groups (*P. incurva*, *attollens*, *groenlandica*) have their nearest known ally in a Himalayan species (*P. excelsa*). Confirmatory of this too is the extraordinary affinity between the Himalayan *P. lachnoglossa* and the American *P. Parryi*.[3] But it also appears as if the ocean barrier which now prevents such communication had been formed prior to the appearance of opposite leaves as a character in this genus. Another fact that strongly corroborates the idea that the genus was not only originally an alternate-leaved one, but that the character of opposite leaves is late of evolution, is

[1] *Proceedings of the Royal Geographical Society*, xxi, 519. But there is no evidence that marine conditions have ever prevailed in northern India to the east of Agra.

[2] The well-known and extremely extensive affinities that exist between the Balkan Peninsula and Asia Minor are of course not affected by, nor in turn do they affect, at least directly, this reasoning which, for the whole Arctic-Alpine flora, is based on an hypothesis of "Migration;" that for the flora of the Mediterranean basin depends on quite another hypothesis—that of comparative "Permanence."

[3] These facts, as in the case of the South Indian species, exactly confirm from the evidence of an Arctic-Alpine genus the evidence from tropical or sub-tropical genera. Mr. C. de Candolle has shown this as regards *Meliaceæ;* Mr. Hemsley as regards genera like *Abelia*, common to Mexico and to Indo-China; and a recent indication of the same thing is the discovery by General Collett of an *Osteomeles*, hitherto supposed to be endemic in the Sandwich Islands, in Burma.

seen in the South Indian species already discussed, which both have alternate leaves, although in the Himalaya itself there are now as many opposite-leaved as there are alternate-leaved forms.

Although the distribution of the genus is almost entirely meridional, examples of the distribution of the same species along several meridians are not very common. Besides that of *P. verticillata*, the most striking instances are those of *P. Oederi* and *P. Sceptrum*, which both occur within the Circumpolar province and both extend along the European and the Siberian meridians. *P. Oederi* extends along the Chinese meridian also as far as the Himalaya, but in a somewhat different condition (VAR. *heteroglossa*). *P. Sceptrum*, on the other hand, is represented in Japan only by a closely allied, but perfectly distinct, species (*P. gloriosa*). *P. sudetica* also occurs in the European and Siberian meridians, but is altogether absent from the Himalo-Chinese. On the other hand, it is represented in the American meridian by the closely allied, although perfectly distinct, *P. scopulorum*.

Nor are the species that have become part of the Intermediate Flora, and that are thus characterised by a zonal distribution, very numerous. In the Temperate Zone, as it is usually understood, the most striking examples are *P. palustris*, *euphrasioides*, *sylvatica*, and *resupinata*. *P. palustris* extends from the British isles throughout Europe, Siberia, Kamtschatka, Alaska, and Rupert's Land to Canada,—throughout the entire temperate complement of the Circumpolar province in fact. *P. sylvatica* extends from the British islands across Europe only; its extension to South-Eastern Scandinavia is, as Mr. Blytt has shewn, an instance of comparatively recent immigration.[1] *P. resupinata* extends across the whole of Siberia and North China to Japan. *P. euphrasioides* extends from Kamtschatka through Alaska, Rupert's Land, and Labrador to South Greenland. It is thus a sub-arctic species rather than a truly temperate one. The comparatively recent occupation of their temperate habitat by these species is evidenced by the fact that they pass from the Japanese to the American meridian uninfluenced by the ancient cleavage that the truly Arctic flora indicates as separating these.

Species with this zonal type of distribution are not, however, confined to the temperate complement of the Circumpolar province. The few species that descend to comparatively low elevations in the Himalaya exhibit the same phenomenon. Thus *P. carnosa* extends at elevations of 5,000—7,000 feet from Kashmir to Khasia, *P. rex* at similar elevations from Khasia to Kwei-tschou. The parallelism between these and *P. sylvatica* and *P. resupinata* respectively is complete. Nor is this all; for just as we have seen that *P. palustris* occupies the fringe of the Circumpolar province in its whole extent, we find *P. gracilis* at elevations of 6,000—10,000 feet in every Himalayan district from Afghanistan to Yunnan.

There are no species in the temperate complement of the present European Alpine province with a zonal distribution like this. And the absence of any such phenomenon there corroborates very strikingly the evidence concerning the tract derived from other sources. We have already supposed that an ancient Mediterranean Ocean prevented an extension beyond their present limits of the European and Siberio-Caucasus meridians. Mr. Ball[2] and Mr. Dyer[3] have independently arrived at the conclusion that the shores

---

[1] Axel Blytt: *Essay on the Immigration of the Norwegian Flora during alternating rainy and dry periods*, p. 78.
[2] Ball: *Spicilegium Floræ Maroccanæ; Jour. Linn. Soc.* xvi, 302.
[3] Dyer: *Plant Distribution as a field for Geographical Research*, p. 16.

of this ocean have formed a centre of preservation for the flora that is now characterised as Mediterranean. The physical conditions that permitted this preservation were exactly those that would prevent an Arctic-Alpine genus from establishing itself in the tract. The absence therefore of the genus *Pedicularis* from temperate Southern Europe while it is present in the temperate Himalaya is excellent negative evidence of the validity of the reasoning of these authors.

A brief review of the distribution of the various divisions and sections, which it has been necessary to defer to this stage, must conclude this chapter. It admits of being done most easily by arranging the whole as before in tabular form.

TABLE XIX.—*Distribution of* Pedicularis *by sections.*

Divisions.	Sections.	Circumpolar.	Europe.	Siberia.	Caucasus.	Japan.	China.	Himalaya.	America.
I.—Longirostres	Siphonanthæ ...	...	...	2	1	...	11	20	...
	Orthorrhynchæ ...	...	...	2	...	1	6	17	...
II.—Adunci ...	Rhyncholophæ ...	6	16	7	2	3	17	36	12
	Bidentatæ ...	4	14	25	3	2	1	9	8
III.—Erostres ...	Anodontæ ...	10	10	14	9	2	14	19	4
	Totals ...	20	40	50	15	8	49	101	24

It is more easily explained still if the diagrammatic method is adopted, and the figures are better appreciated when put in the form of percentages.

DIAGRAM 6.

Distribution of the **LONGIROSTRES.**

Total ... ... 54 sp.
Percentage 20%

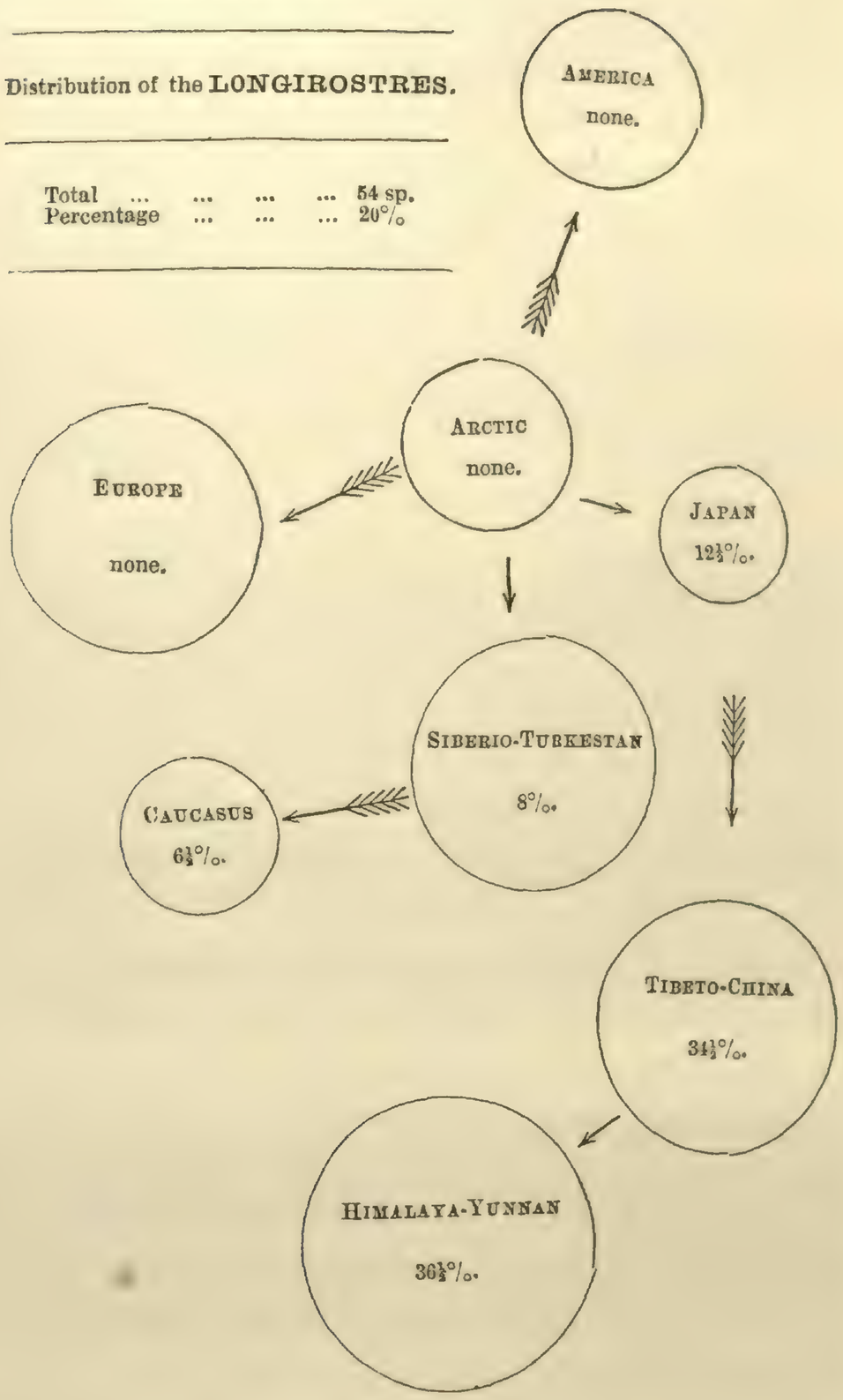
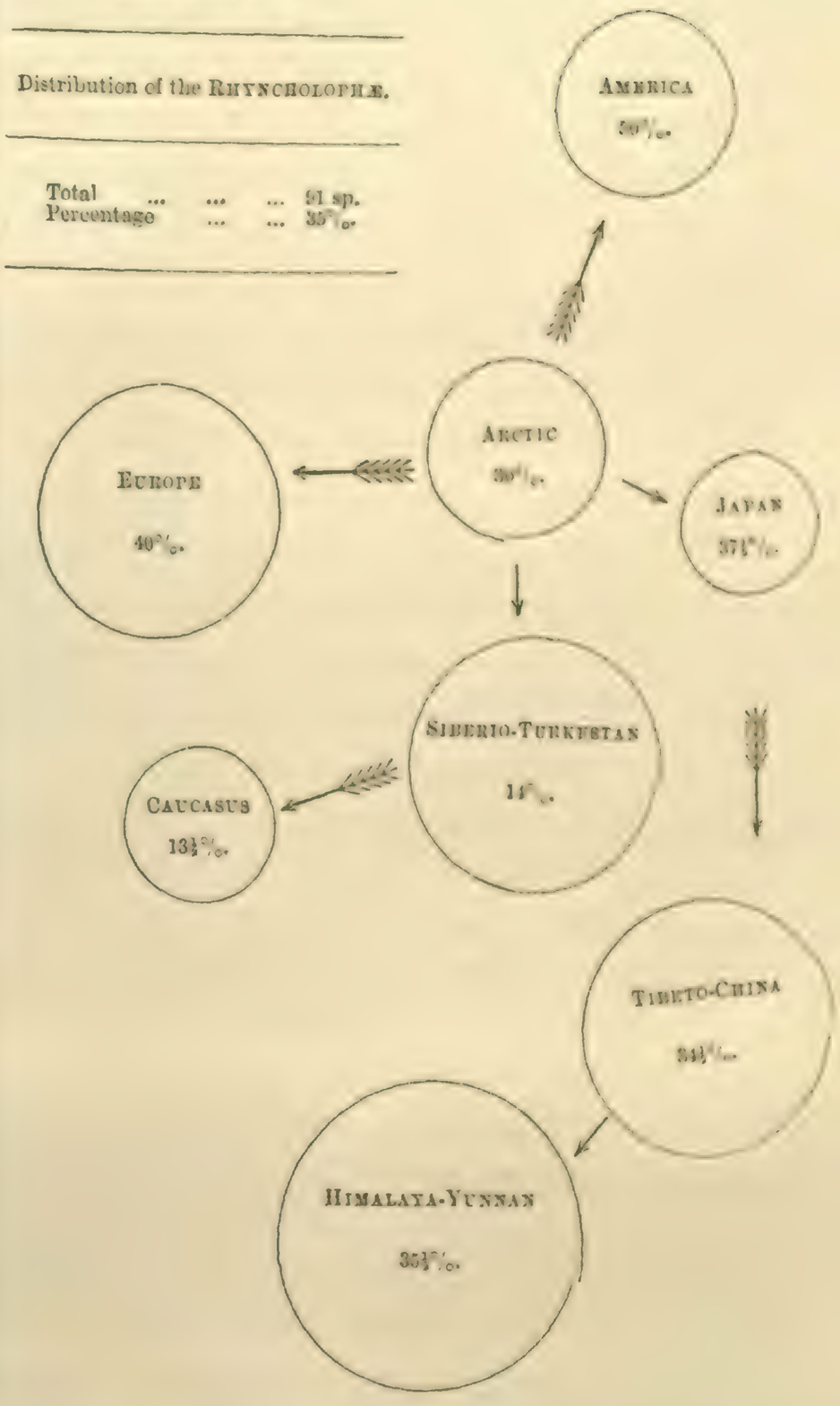


DIAGRAM 7.

Distribution of the RHYNCHOLOPHÆ.

Total ... ... 91 sp.
Percentage 35%



As the highest division LONGIROSTRES and the section RHYNCHOLOPHÆ practically include all the "beaked forms" from which the upper percentages in diagram 3 (p. 45) are derived, it seems better to discuss them side by side. It has, however, to be recollected that these sections—the RHYNCHOLOPHÆ especially—include also forms that possess corollas exhibiting the other characters that indicate a higher specialisation of structure but without having happened to develope long beaks. The two long-beaked sections require no detailed consideration. They are almost equal in numbers and in degree of specialisation of structure; they exist side by side and are uniformly distributed; they have soriginated in the same provinces and apparently contemporaneously; and finally, while quite distinct from each other, they exhibit the same degree of relationship to the RHYNCHOLOPHÆ. Both of them appear from diagram 6 to have been evolved towards the equatorial extremity of the Chinese meridian of distribution. We have already been led to conclude from morphology that they form the most highly specialised division; this conclusion has shown the probability of its being the division most recently evolved; its present distribution shows that this is not probable merely, but almost certainly the case. It has not extended, along its own meridian even, as far as the Circumpolar province during the most recent northern migration. That it has not done so in previous ones seems certain not only from its complete absence from the Circumpolar province now, but

from the American and European meridians as well. The presence of a few forms on the Siberio-Caucasus meridian, which at first appears to invalidate this conclusion, on closer examination confirms it. For when we examine the distribution of the individual species, it is found that the one which extends westward to Persia (*P. siphonantha*)[1] is an example of the few species that have become sub-Alpine as well as Alpine, and as such has the zonal distribution characteristic of its class, and the four that extend to Siberia are clearly examples of forms attracted to adjacent mountain flanks during a period of retreat. More striking still, only one of these (*P. longiflora*) has yet *overflowed* the mountain barrier to the slopes and plains beyond.

The RHYNCHOLOPHÆ are, as diagram 7 shows, very generally distributed, the most striking features of this distribution being—

(1) the high percentage in the American meridian;
(2) the uniform percentage along the whole extent of the Siberio-Caucasus and the Japan-Himalayan meridians; and
(3) the low percentage of the Siberio-Caucasus meridian.

The uniformity along the Siberian and Chinese meridians, coupled with the marked difference between the two, corroborates the whole of the other evidence as to the distinctness of these meridians. The high percentage of the American meridian, coupled with the fact that it is on this meridian that the highest type of Rhyncholophous corolla occurs, seems to indicate that here this section took origin. Its presence both in Europe and in the Chinese meridian in proportions which, while not quite equal to that in America, are nevertheless high, strongly supports this view, and we have already seen that, so far at least as the Himalayan province is concerned, there appears to have been, during one or other of the periods of furthest advance, zonal communication between the equatorial end of the American meridian and it. But the high percentage in the Circumpolar province shows that it is probable that some at least of the Rhyncholophous forms were evolved at a comparatively remote date and were conducted to the neighbourhood of the pole during a period of retreat anterior to the last, and that, issuing thence during the last southward migration, they were not only redistributed in America but in the European meridians as well. The ancient cleavage already alluded to more than once as existing between Greenland and Alaska made this impossible so far as the Chinese meridian is concerned; it is therefore a very striking corroboration of the general hypothesis to find that the European Rhyncholophæ are all of comparatively simple type (*Rostratæ*), as from their polar derivation they might be expected to be, while in the Himalaya there are but two or three examples of this type, though many are almost as highly specialised as the American forms themselves, and are, moreover, closely allied to them. The low percentage in the Siberian meridian seems to show that the last southward migration commenced before many forms had extended eastward by Lapland to Arctic Siberia, while the barriers of an Aralo-Caspian Sea to the west, and of an unbroken mountain chain with a more rigorous climate along its summit to the east, prevented zonal communication with Europe and China respectively.

The distribution of the ADUNCÆ as a whole, which is shown in diagram 8, does not afford evidence that is either direct or conclusive. This is because the two sections that compose them, besides having been, like the sections of LONGIROSTRES, evolved independently, have, unlike SIPHONANTHÆ and ORTHORRHYNCHÆ, originated at a different

[1] *P. siphonantha* extends from Elburz on the west through Afghanistan, Kashmir, Kamaon, Nepal, Sikkim, and Chumbi to Szetschuan.

period, in a separate locality and, most probably, also under unlike conditions. The justice of these conclusions becomes more apparent when the remaining sections are discussed in detail. More is gained therefore by merely comparing the distribution of this division with that of the remaining sections *conjointly*, as shown in diagram 9, and then analysing the latter.

DIAGRAM 8.

Distribution of the **ADUNCÆ.**

Total ... ... 165 sp.
Percentage ... ... 63·2%.

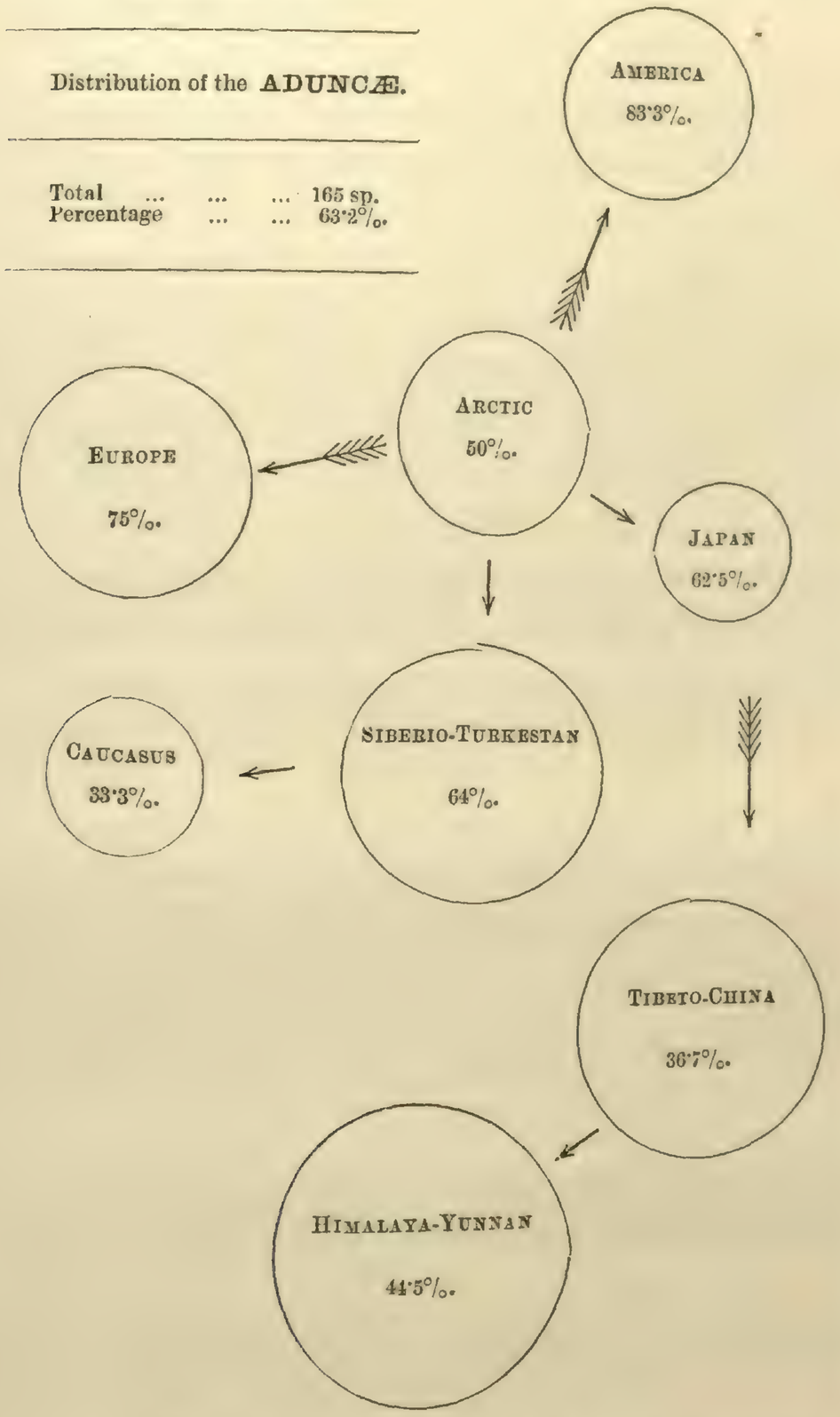
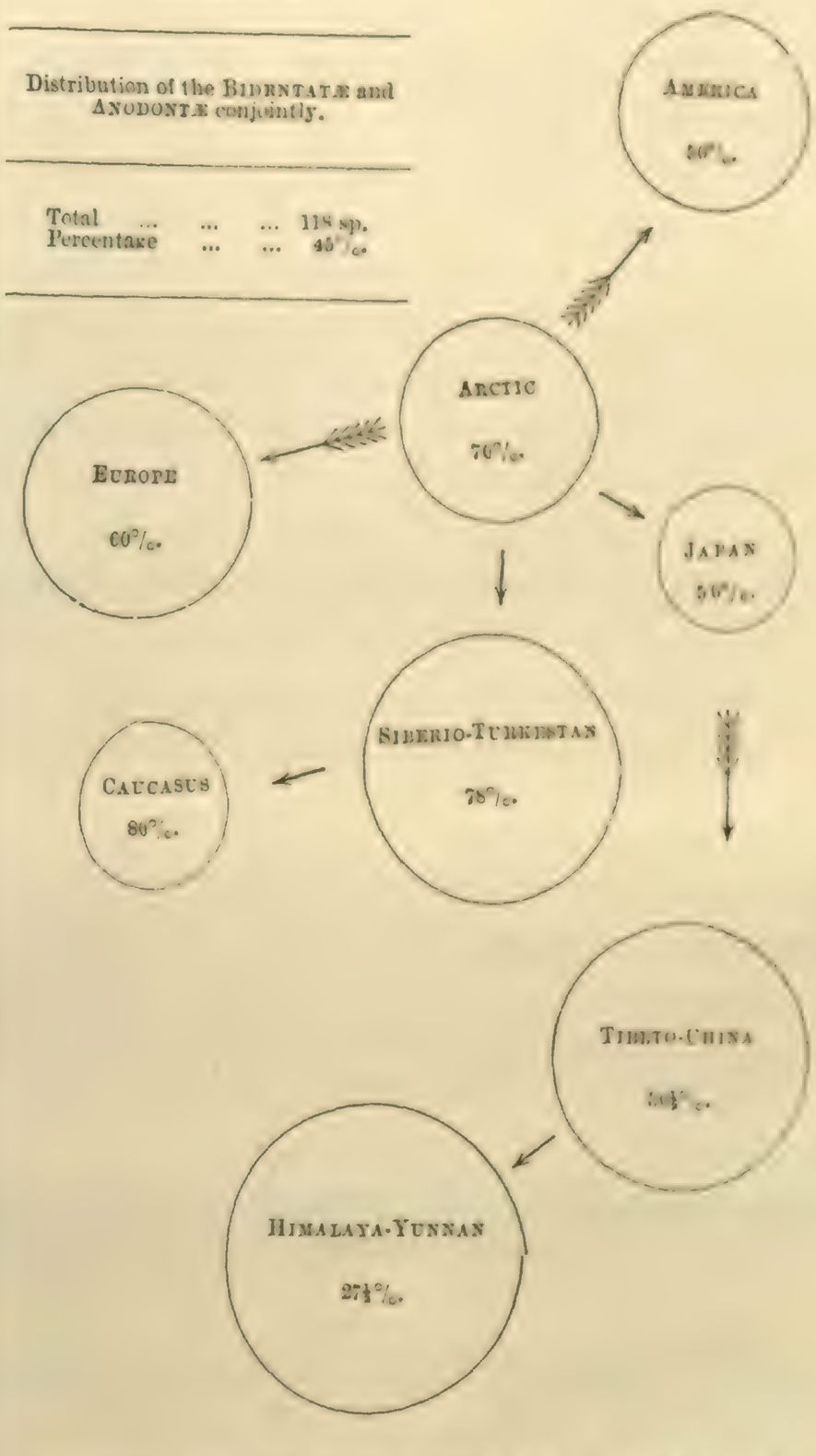


DIAGRAM 9.

Distribution of the BIDENTATÆ and ANODONTÆ conjointly.

Total ... ... 118 sp.
Percentage ... ... 45%.



The BIDENTATÆ and the ANODONTÆ are composed entirely of beakless forms, and therefore diagram 9 practically repeats the lower percentages already exhibited in diagram 3. The differences are due to localisation, owing to their other natural affinities, of one beakless form in the section SIPHONANTHÆ and of thirteen more in the section RHYNCHOLOPHÆ.

The most notable features of the diagram are—

(1) the high percentage in the Circumpolar province;
(2) the gradual decrease along all the meridians of distribution save one; and
(3) the gradual increase along that one (the Siberio-Caucasus) meridian.

The evidence already adduced from morphology, that the beakless type of corolla is the more archaic one, is corroborated by the high percentage in the circumpolar region, where the forms still experience natural conditions such as probably prevailed

before the genus began its first migration; it is further strengthened by the decrease of this percentage along the various meridians directly with the distance from the pole. The single exception of the Siberio-Caucasus meridian, as before, strengthens rather than weakens the general evidence. Along the north-west flanks of the mountain system that now practically constitutes it, but that originally limited it on the east and south, there was an unbroken continuity of the physical conditions of its original home, not during advance only, but during retreat as well, while communication with neighbouring meridians was till a very late period shut off on one side by this mountain system and on the other by a sea. Uninfluenced from without and with a continuous similarity of environment, the species of this meridian retained throughout a uniformity of character which disappeared from those of the other meridians.

These two sections have now to be considered separately. Morphological considerations have led us to conclude that the relationship of the BIDENTATÆ to the ANODONTÆ is one of direct descent. But the same considerations have shown that this is also true of the RHYNCHOLOPHÆ, and from the absence of any evidence that the RHYNCHOLOPHÆ have been derived from the BIDENTATÆ, we had to assume that the relationship between these sections is one of collateral descent from the ANODONTÆ. This presumption, based on the absence of evidence that the BIDENTATÆ were intermediate between the other two sections mentioned, is now established by the direct evidence from distribution. We now find that the BIDENTATÆ probably originated at a later date than the RHYNCHOLOPHÆ and under somewhat different conditions.

DIAGRAM 10.

Distribution of the BIDENTATÆ.

Total ... ... 54 sp.
Percentage ... ... 20½%.

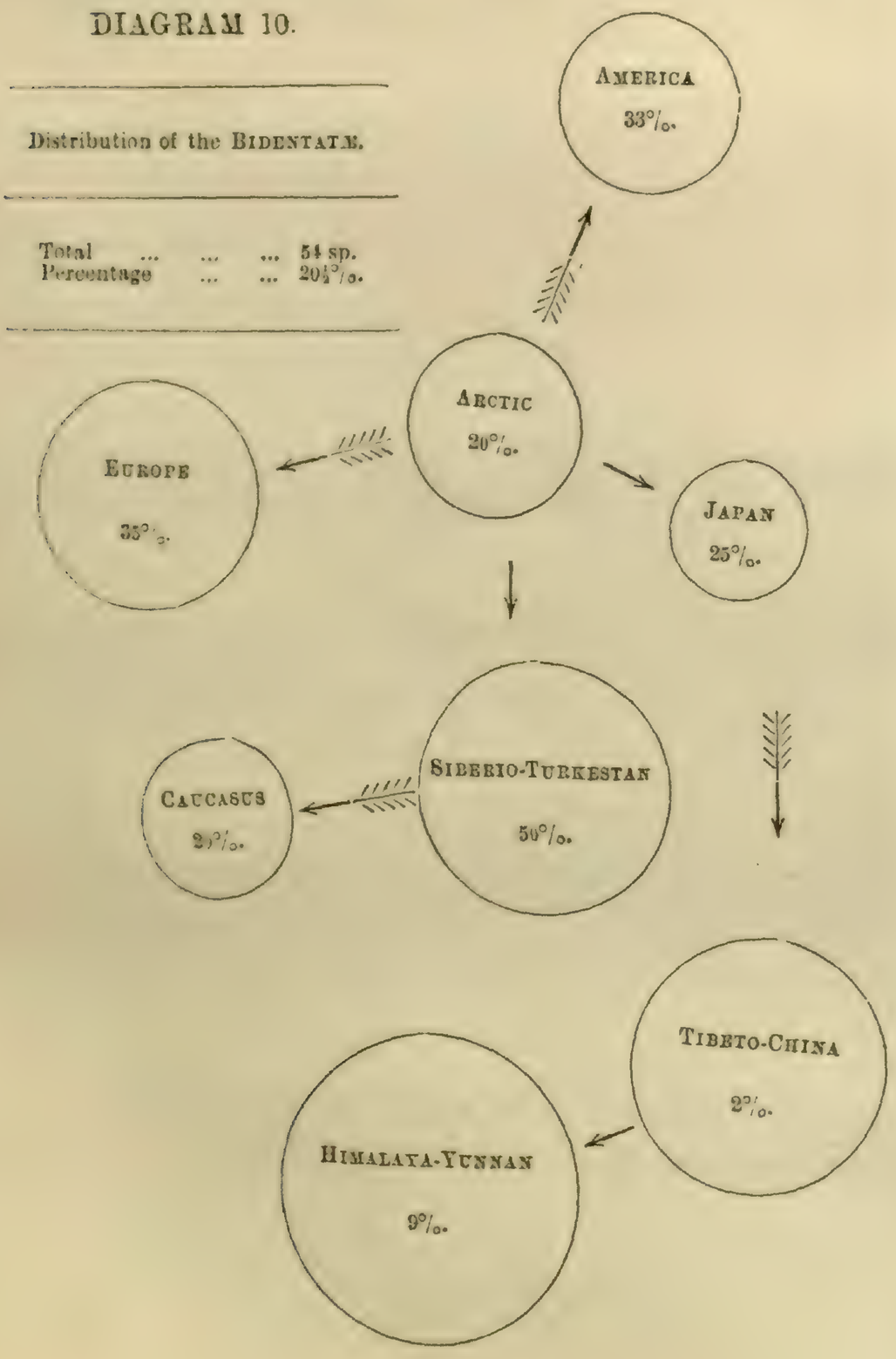
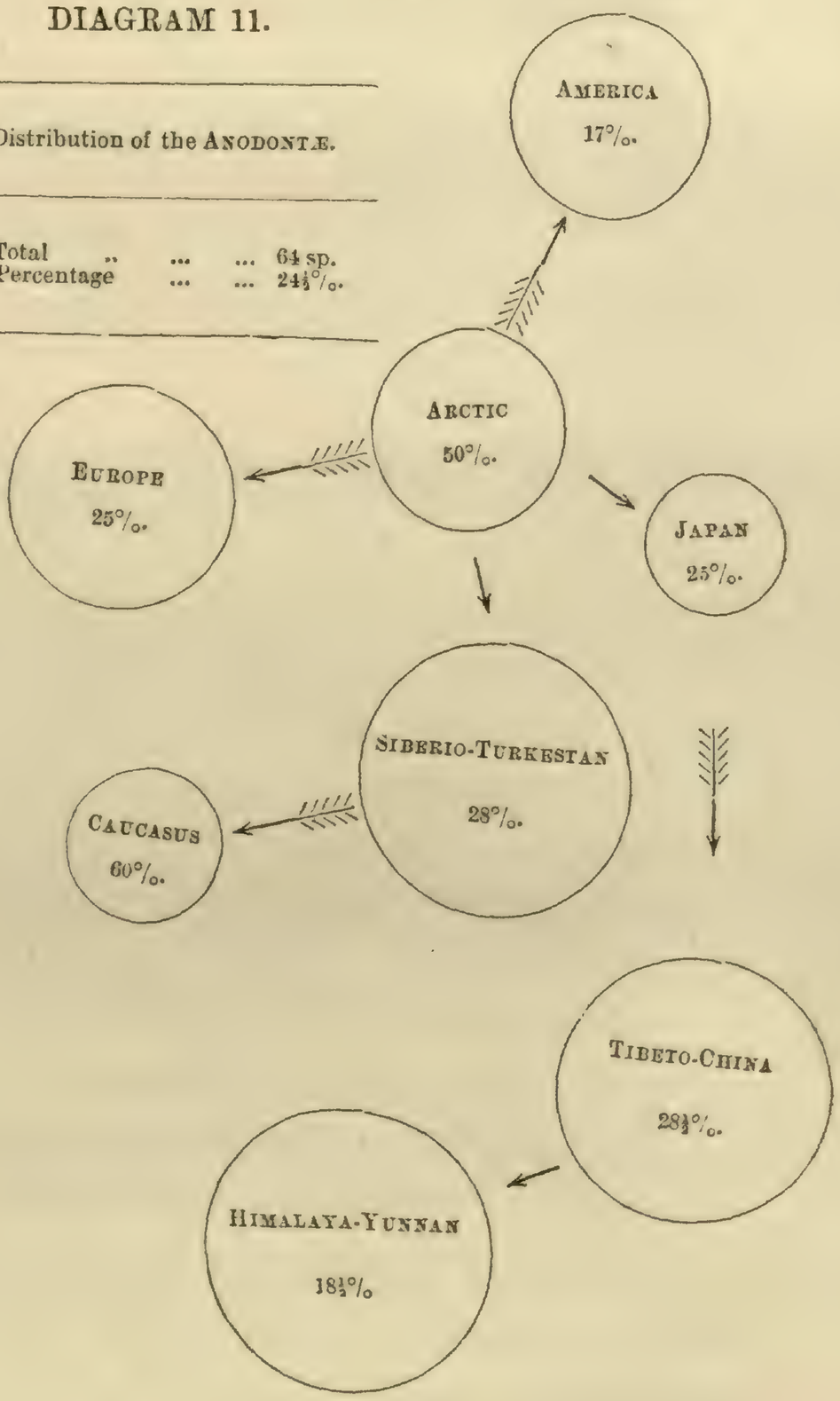


DIAGRAM 11.

Distribution of the ANODONTÆ.

Total ... ... 64 sp.
Percentage ... ... 24⅓%.



This is best shown by diagram 10, which exhibits the distribution of the section and shows how unlike it is to that of any other. The highest percentage (as it happens the highest actual number also) of Bidentate species occurs in the Siberio-Turkestan province. The decrease of the percentage in the Caucasus appears to indicate that the section was evolved on the Siberian meridian during the last period of retreat, and that, too, comparatively recently. Another indication that this type of corolla originated in Siberia is that the only alternate-leaved Bidentate species in China and the Western Himalaya (*P. dolichorrhiza*) is an excellent example of overflow from one to another adjacent meridian. This section contains the greater number of individuals that belong to the temperate-intermediate flora, and that are characterised by a zonal distribution. In discussing species of that class, we have already seen that these particular species were probably evolved under the temperate conditions they now prefer; and this, as we have seen, could only happen at a time when climatic changes had ceased to be progressive, which time, for these species, must have been just as the point of furthest retreat was being reached. But diagram 10 shows further that this character of distribution is not confined to these few species, but is exhibited by the section as a whole; for there is a higher percentage in each of the four provinces bordering on the Circumpolar than in any province more remote, and also than in the Circumpolar province itself. It seems therefore impossible to come to any other conclusion than this:—that the BIDENTATÆ were evolved under temperate rather than under Arctic or Alpine conditions, and that they appeared at a comparatively recent period.

The occurrence of BIDENTATÆ in the most easterly division of the Himalayan province appears at first sight to invalidate this reasoning, but in reality it affords it the strongest confirmation. For, first, the Himalayan BIDENTATÆ are Indo-Chinese and not Emodic—they thus characterise the division where the physical conditions are temperate rather than Alpine. Then, the complete absence of BIDENTATÆ from China (the single exception of *P. dolichorrhiza*, as has been said, is an example of overflow) indicates an independent appearance of BIDENTATÆ in Indo-China. And finally, all these Indo-Chinese BIDENTATÆ have opposite leaves. Now we have already seen that the appearance of even the most highly specialised of the RHYNCHOLOPHÆ in all probability preceded the occurrence of opposite leaves in any section. It becomes therefore almost certain that in Indo-China, as in Siberia, the appearance of BIDENTATÆ was subsequent, and probably in both provinces was long subsequent, to the appearance of the RHYNCHOLOPHÆ.

The distribution of the ANODONTÆ shown in diagram 11 alongside of that of the BIDENTATÆ requires only brief notice. It confirms the evidence advanced already from other sources that the Anodontous is the most archaic type of corolla, and that the ANODONTÆ form the oldest section. The explanation of the distribution of the BIDENTATÆ enables us to see that the apparent contradiction of this, on the migration hypothesis, for the Siberian meridian now disappears. We are, however, left face to face with the curious fact that the Caucasus province, which is the equatorial termination of the Siberian meridian, exhibits a percentage of archaic forms higher than that of any province,—higher even than that of the Circumpolar province itself. The only possible explanation of this is that the Caucasus has been a centre of preservation for forms of archaic type. But this explanation appears perfectly sufficient; for when the southward migration into the Caucasus province first took place, it did so owing to arctic conditions prevailing on the plains of Turkestan. But owing to the presence of an Aralo-Caspian

Sea to the north-west and the barrier of an inclement mountain chain on the south-east, the path of immigration into this province was comparatively narrow, and accommodated comparatively few species. Then, during the period of stability that followed, the natural conditions that made the shores of the Mediterranean Ocean a centre of preservation for the present flora of the Mediterranean basin, prevented the wide extension of such species as had gained access to the arctic and sub-arctic portions of the province. And finally, when retreat began, temperate conditions were early established on the territory through which these invading forms had reached the Caucasus. Their retreat being thus cut off, they could only extend in the Alpine parts of the Caucasus province itself. But as their advance had been greatly checked, the forms thus cut off were few in number, and in place of finding the area subject to natural conditions suitable for their existence steadily curtailed, they found it continue ample. Internal pressure thus being minimised, and there being practically no external pressure, there was little stimulus in this province, compared with any other, to variation at all, such variations as naturally appeared deviating far less than variations elsewhere did from the original archaic types.[1]

[1] The new species alluded to by M Franchet (see above, p. 1, foot-note 12) have been published by Messrs. Forbes and Hemsley (*Jour. Linn Soc.* xxvi, 204–220; April 12, 1890) while this paper has been passing through the press. They are contained in a list of 94 Chinese *Pediculares*, 10 of which are advanced as new. The following species in the list call for remark:—15. P. conifera *Maxim.* A new species from Hupeh, forming a monotypic series with a corolla-structure that corroborates the evidence on which (p. 18) the tribe VERTICILLATÆ has been suppressed.—27. P. filicifolia *Hemsl.* A new species from Hupeh, a member of the series Axillares.—30. P. gracilis *Wall.* is now reported from Hupeh in Southern China.—34. P. hirtella *Franchet.* A new species from Yunnan of great interest as being the first alternate-leaved BIDENTATA reported from the Chinese meridian of distribution. In the absence of specimens and in the absence of a full description of the lip, its localisation in the sub-section Striatæ must be considered merely tentative.—36. P. integrifolia *Hook. f.* is now reported from Yunnan.—41. *P. leiandra* Franchet. This name is proposed for a plant from Yunnan that Mr. Maximowicz has (*Mel. Biol.* xii, 818) referred to P. porrecta *Wall.* As Mr. Maximowicz has been able (cf. *Mel. Biol.* xi, 283) to compare it with a Wallichian specimen, while M. Franchet admits that he has only seen a specimen collected by M. Jacquemont and named (in Herb. Paris) by the late Mr. Bentham, the proposed name is not at present acceptable. There is nothing in its description to separate the Yunnan plant from the Sikkim form of *P. porrecta* (plate 20, B) with fleshy roots, and this Sikkim plant is certainly not specifically distinct from the true *P. porrecta* of the N.-W. Himalaya.—48. P. macilenta *Franchet.* A new species from Yunnan, a member of the group *Oxycarpæ*.—50. *P. melampyriflora* Franchet. This name is substituted for P. melampyrifolia *Franchet* (*Mel. Biol.* xii, 896: 1888) which has priority. But "la publication est un *fait* que l'auteur ne peut pas annuler," (*A. De Cand., Lois*, 61) and M. Franchet is responsible, even if unintentionally so, for the earlier name.—56. P. oxycarpa *Franchet* is now reported from Szetschuan.—71. P. salviæflora *Franchet.* An interesting new species from Yunnan placed, on account of its habit, near the group *Fragiles*, but on account of its inadequately described corolla kept apart and situated between that group and the group *Collata*.—79. P. strobilacea *Franchet.* A new Yunnan species apparently a SIPHONANTHA and probably a *Longiflora*; unfortunately the staminal insertion is not given in the description.—88. P vagans *Hemsl.* An interesting new RHYNCHOLOPHA from Szetschuan which helps to connect the group *Excelsa* with the rest of the section.—92. P. Viali *Franchet.* A still more interesting new species from Yunnan, connecting the American series Surrectæ *Maxim.*, of which it possesses the disproportionately small lip, with the Himalayan series Excelsa *Maxim.* with which it shares the peculiar character (hitherto known only in *Excelsa* and in *Fragiles*) of a mid-lobe of lip larger than the lateral lobes.—93. P. villosula *Franchet.* A new ORTHORRHYNCHA from Yunnan, belonging to the group *Debiles*.

There are thus (excluding *P. leiandra*) nine new species, and the total for the genus is now 270 species. Three (*P. conifera, filicifolia, vagans*) are endemic additions to the Chinese province; two (*P. gracilis, oxycarpa*) are extensions thither. The total for China is now (cf. p. 25) raised from 49 to 54, the endemic factor is increased from 35 to 38, and the percentage decreased from 71·4 to 70·3. The other six are endemic in Yunnan, and raise the Himalo-Yunnan total (cf. p. 25) from 101 to 107. But the endemic figure stated already being too great by two (*P. gracilis, oxycarpa*), the factor is raised only from 90 to 94 and the endemic percentage falls from 89·1 to 87·8. For Yunnan (cf. p. 35) the total is now 47 (endemic 33), so that the percentage changes from 70·0 to 70·1; for Szetschuan (cf. p. 37) the total is now 30 (endemic 9), so that the percentage changes from 32·1 to 30·0.

The extension of *P. gracilis* to Hupeh is what might be expected from the nature of its distribution (cf. p. 51) and evidence from it has to be discounted precisely as the evidence from *P. euphrasioides* has had (p. 44) to be discounted. If therefore the appearance of *P. oxycarpa* in Szetschuan appears to invalidate the annexation (p. 37) of Yunnan to the Himalaya, this is more than counterbalanced by the occurrence of *P. integrifolia* in Yunnan as well as in Chumbi.

PART II.—SYSTEMATIC ARRANGEMENT OF THE INDIAN SPECIES.

CHAPTER V.—HISTORICAL ACCOUNT OF INDIAN SPECIES.

From those districts of the Himalayan province that come within the scope of the descriptive portion of this paper, there have been, so far, seventy species reported. Fifty-five of these are capable of complete description; thirteen have not yet been collected in fruit; one has been collected in fruit, but not in flower; one is only represented by leaf specimens and cannot therefore be described, all that may be predicated of it being that it is not referable to any described species, and that it most probably belongs to the sub-section *Eusiphonanthæ* of the Siphonanthæ or to the sub-section *Hyposiphonanthæ* of the Rhyncholophæ. Of the rest, 30 species belong to the division LONGIROSTRES, 25 to the ADUNCÆ, and 14 to the EROSTRES.

The earliest published descriptions of Indian species of Pedicularis are those of *P. Oederi*,—from Scandinavian examples—in 1806[1] and of *P. longiflora*—from Siberian examples—in 1811,[2] but the first author to describe species from Indian examples was Mr. D. Don, who published three species in 1825[3] and described a fourth as a *Rhinanthus*. In 1828[4] Dr. Wallich issued sheets of what professed to be 13 species, 11 of these being different from those described by Don, but only six of which now stand with Wallich's names; one of the six (*P. carnosa*) was described and figured by Wallich in 1831.[5] In 1834[6] a figure of a South Indian species was published without specific name or description. This species (*P. zeylanica*) had been issued by Wallich in 1829 as a *Torenia*, but was, along with three other new species, described from Indian specimens by Mr. Bentham in 1835.[7] In 1841-2[8] three Indian species were described from Siberian specimens. In 1843[9] an Indian species issued by Wallich was differentiated and re-named by Dr. Bunge, and was described under Bunge's name in the following year.[10] In this year (1844)[11] M. Decaisne described and figured two Indian species already distinguished under other names by Don and Schrenk. In 1846[12] Mr. Bentham, while monographing the genus, distinguished two more Indian species (*P. Perrottetii* and *P. flagellaris*), and described under a new name (*P. cabulica* = *P. dolichorrhiza*) one already distinguished by Schrenk. In 1850[13] Wight figured the two already-described South Indian species; Boissier in 1853[14] diagnosed still another Indian species from Persian examples; and in 1862[15] Klotzsch described as new, and figured, five species, only two of which in reality had previously been unknown or undifferentiated.

---

[1] *Hornem., Oekon. Plantel.*, ed. ii, p. 580.
[2] *Mem. Acad. Petersb.* iv, 345.
[3] *Prodr. Flor. Nepal.* 94, 95.
[4] *Lithogr. Catalog.*, nn. 411—423.
[5] *Plant. Asiat. Rar.* ii, 44, t. 154.
[6] *Baikie, Observ. Nilgher.* App. viii, t. 2.
[7] *Scrophularineæ Indicæ*, pp. 51—54.
[8] *Fischer and Meyer, Enum. Plant. Nov. a C. Schrenkio lect.* i, 22; ii, 19, 23.
[9] *Bull. Sc. Acad. Petersb.* viii, 251.
[10] *Walp. Rep.* iii, 415.
[11] *Jacquemont's Voyage, Bot.* 117, 118; tt. 122, 123.
[12] *DC. Prodr.* x, pp. 565, 581; 575.
[13] *Icones* tt. 1418, 1419.
[14] *Diagn.*, Ser. i; xii, 45.
[15] *Ergebn. Reis. Pr. Waldem., Bot.*, pp. 106—109, tt. 57-61.

In 1877[1] Mr. Maximowicz described two Indian species from Chinese or Mongolian examples, and in 1881[2] one more from Indian specimens. In the same year Dr. Watt[3] described and figured under a new name a species already figured by Klotzsch. When describing the Indian species in 1884,[4] Sir J. D. Hooker published diagnoses of 14 species previously undescribed, and again in 1888[5] Mr. Maximowicz published descriptions and figured the flowers of 11 previously inedited Indian species; while, in 1889,[6] the writer issued diagnoses of 17 more, taking the opportunity of arranging these and also the species described by Mr. Maximowicz according to the method of the *Flora of British India* so as to facilitate the field-study of the genus by those interested in it in India.

TABLE XX.—*Chronology of the Indian species of Pedicularis.*

Date.	NAME AND AUTHOR OF SPECIES.	Place of publication.	Locality of original specimen.	REMARKS.
1806 ...	P. Oederi *Vahl.*	Hornem., Oekon. Plantel., ed. 2.	Europe ...	Described; already figured by Oeder (1761) and by Haller (1788).
1811 ...	P. longiflora *Rudolph*	Mem. Acad. Petersb. iv.	Siberia ...	Described and figured.
1825 ...	P. brevifolia *Don;* P. megalantha *Don;* P. siphonantha *Don.*	Don: Prodr. Flor. Nepal	India ...	Described.
1828 ...	P. carnosa *Wall.;* P. furfuracea *Wall.;* P. gracilis *Wall.;* P. mollis *Wall.;* P. pectinata *Wall.;* P. porrecta *Wall.*	Wallich: Lithogr. Catalog.	India ...	Edited without descriptions; *P. carnosa* subsequently described and figured in 1831 in *Pl. As. Rar.* ii.
1835 ...	P. elephantoides *Benth.;* P. pyramidata *Royle;* P. tenuirostris *Benth.;* P. zeylanica *Benth.*	Bentham: Scrophularineæ Indicæ.	India ...	Described; *P. zeylanica* previously figured in *Baikie, Observ. Nilgher.*, and subsequently in *Wight, Icones.*
1841 ...	P. rhinanthoides *Schrenk* ...	Fischer and Meyer's Enum. Pl Nov., i.	Siberia ...	Described.
1842 ...	P. cheilanthifolia *Schrenk;* P. dolichorrhiza *Schrenk.*	Ditto ditto, ii ...	Siberia ...	Described.
1843 ...	P. Wallichii *Bunge*	Bull. Acad. Petersb. viii ...	India ...	Name only; described in 1844 in *Walp., Rep.* iii.
1846 ...	P. flagellaris *Benth.;* P. Perrottetii *Benth.*	DC. Prodr. x. ...	India ...	Described; *P. Perrottetii* figured in 1850 in *Wight, Icones.*
1853 ...	P. pycnantha *Boiss.*	Diagn. Ser. i, 12 ...	Persia ...	Described.
1862 ...	P. macrantha *Kl.;* P. bicornuta *Kl.*	Ergebn. Reis. Pr. Waldem., Bot.	India ...	Described and figured.
1877 ...	P. alaschanica *Maxim.;* P. Przewalskii *Maxim.*	Mel. Biol. x	China ...	Described.
1881 ...	P. Roylei *Maxim.*	Mel. Biol. xi	India ...	Described.
1884 ...	P. bella *Hk. f.;* P. Clarkei *Hk. f.;* P. curvipes *Hk. f.;* P. denudata *Hk. f.;* P. Elwesii *Hk. f.;* P. excelsa *Hk. f.;* P. flexuosa *Hk. f.;* P. globifera *Hk. f.;* P. integrifolia *Hk. f.;* P. lachnoglossa *Hk. f.;* P. microcalyx *Hk. f.;* P. polygaloides *Hk. f.;* P. robusta *Hk. f.;* P. trichoglossa *Hk. f.*	Flor. Brit. Ind. iv ...	India ...	Described.

[1] *Melanges Biologiques* x, pp. 84 and 91.
[2] *Melanges Biologiques* xi, p. 288.
[3] *Jour. Linn. Soc.* xviii, 381.
[4] *Flora of British India*, vol. iv, pp. 306—317.
[5] *Melanges Biologiques* xii, pp. 769—919.
[6] *Jour. As. Soc. Bengal* lviii, part 2, pp. 255—278.

TABLE XX.—*Chronology of the Indian species of Pedicularis*—concluded.

Date.	NAME AND AUTHOR OF SPECIES.	Place of publication.	Locality of original specimen.	REMARKS.
1888 ...	P. comptoniæfolia *Franch.*; P. fragilis *Prain*; P. Garckeana *Prain*; P. gruina *Franch.*; P. instar *Prain*; P. Kingii *Prain*; P. lyrata *Prain*; P. ophiocephala *Maxim.*; P. Prainiana *Maxim*; P. rex *Clarke*; P. Scullyana *Prain*.	Mel. Biol. xii ...	India ...	Described and (except *P. Garckeana*) figured.
1889 ...	P. albiflora *Prain*; P. chumbica *Prain*; P. collata *Prain*; P. Collettii *Prain*; P. confertiflora *Prain*; P. corymbosa *Prain*; P. Daltoni *Prain*; P. Gammieana *Prain*; P. gibbera *Prain*; P. Heydei *Prain*; P. nepalensis *Prain*; P. odontophora *Prain*; P. Oliveriana *Prain*; P. Pantlingii *Prain*; P. Regeliana *Prain*; P. schizorrhyncha *Prain*; P. tenuicaulis *Prain*.	Jour. As. Soc. Beng., vol. lviii, pt. 2.	India ...	Described.

The iconography of the Indian species has been by no means synchronous with the appearance of accepted names. This is well seen by consulting the following table:—

TABLE XXI.—*Iconography of Indian species; arranged chronologically.*

Date.	NAME OF SPECIES.	Author and place of publication.	Name given in work cited.	Locality of plant figured.
1761 ...	P. Oederi ...	Oeder: Flor. Dan. i, t. 30	*P. flammea* ...	Norway.
1788 ...	P. Oederi ...	Haller: Stirp. Helv. i, t 8, f. 3.	*P. alpina caule simplici*, etc.	Switzerland.
1811 ...	P. longiflora ...	Rudolph: Mem. Acad. Petersb. iv, t. 3 ...	P. longiflora ...	Siberia.
1823 ...	P. Oederi ...	Reichb.: Iconogr. Cent. i, t. 14, f. 31 ...	*P. versicolor* ...	Switzerland.
1831 ...	P. carnosa ...	Wallich: Plant. As. Rar. ii, t. 154 ...	P. carnosa ...	Nepal.
1834 ...	P. zeylanica ...	Baikie: Observ. Nilgher., ed. i, t. 2 ...	Pedicularis sp. ...	South India.
1839 ...	P. Oederi ...	Royle: Ill. Himal., t. 72, f. 2	*P. versicolor* ...	Kashmir.
1844 ...	P. siphonantha ...	Decaisne: Jacq. Voy., Bot. t. 122	*P. punctata* ...	West Himalaya.
	P. rhinanthoides VAR. labellata.	Decaisne: Jacq. Voy., bot. t. 123	*P. labellata* ...	West Himalaya.
1850 ...	P. Perrottetii ...	Wight: Icones iv, t. 1418	P. Perrottetii ...	South India.
	P. zeylanica ...	Wight: Icones iv, t. 1419	P. zeylanica ...	South India.
1851 ...	P. mollis ...	Hooker: Bot. Magaz. lxxvii, t. 4599 ...	P. mollis ...	England; introduced.
1862 ...	P. Oederi ...	Reichb. f.; Flor. Germ. xx, t. 1759, f. 2 ...	P. Oederi ...	Switzerland.
1862 ...	P. longiflora ...	Klotzsch; Reis. Pr. Wald, Bot. t. 57 ...	*P. tubiformis* ...	West Himalaya.
	P. siphonantha ...	Ditto ditto, Bot. t. 58 ...	*P. himalayca* ...	West Himalaya.
	P. macrantha ...	Ditto ditto, Bot. t. 59 ...	P. macrantha ...	West Himalaya.
	P. megalantha ...	Ditto ditto, Bot. t. 60 ...	*P. Hoffmeisteri* ...	West Himalaya.
	P. bicornuta ...	Ditto ditto, Bot. t. 61 ...	P. bicornuta ...	West Himalaya.
1881 ...	P. bicornuta ..	Watt: Jour. Linn. Soc. xviii, t. 13 ...	*P. eximia* ..	West Himalaya.

TABLE XXI.—*Iconography of Indian species ; arranged chronologically*—concluded.

Date.	Name of Species.	Author and place of publication.	Name given in work cited.	Locality of plant figured.
1888 ...	P. Perrottetii ...	Maximowicz : Mel. Biol. xii, t. 1, f. 1 ...	P. Perrottetii ...	South India.
	P. Przewalskii ...	Ditto ditto, t. 1, f. 2 ...	P. Przewalskii ...	North Tibet.
	P. bella ...	Ditto ditto, t. 1, f. 3 ...	P. bella ...	East Himalaya.
	P. elephantoides ...	Ditto ditto, t. 1, f. 4 ...	P. elephantoides	Kashmir.
	P. Scullyana ...	Ditto ditto, t. 1, f. 6 ...	P. Scullyana ...	East Himalaya.
	P. macrantha ...	Ditto ditto, t. 1, f. 5 ...	*P. ochroleuca* ...	West Himalaya.
	P. Elwesii ...	Ditto ditto, t. 1, f. 8 ...	P. Elwesii ...	East Himalaya.
	P. gruina ...	Ditto ditto, t. 1, f. 15 ...	P. gruina ...	Yunnan.
	P. integrifolia ...	Ditto ditto, t. 2, f. 23 ...	P. integrifolia ...	East Himalaya.
	P. pectinata ...	Ditto ditto, t. 2, f. 25 ...	P. pectinata ...	West Himalaya.
	P. pyramidata ...	Ditto ditto, t. 2, f. 27 ...	P. pyramidata ...	West Himalaya.
	P. tenuirostris ...	Ditto ditto, t. 2, f. 26 ...	P. tenuirostris ...	West Himalaya.
	P. instar ...	Ditto ditto, t. 2, f. 32 ...	P. instar ...	East Himalaya.
	P. flexuosa ...	Ditto ditto, t. 2, f. 35 ...	P. flexuosa ...	Sikkim.
	P. excelsa ...	Ditto ditto, t. 3, f. 44 ...	P. excelsa ...	East Himalaya.
	P. zeylanica ...	Ditto ditto, t. 3, f. 45 ...	P. zeylanica ...	South India.
	P. furfuracea ...	Ditto ditto, t. 3, f. 50 ...	P. furfuracea ...	East Himalaya.
	P. carnosa ..	Ditto ditto, t. 3, f. 52 ...	P. carnosa ...	East Himalaya.
	P. lachnoglossa ...	Ditto ditto, t. 3, f. 55 ...	P. lachnoglossa ...	East Himalaya.
	P. Clarkei ...	Ditto ditto, t. 3, f. 60 ...	P. Clarkei ...	East Himalaya.
	P. trichoglossa ...	Ditto ditto, t. 3, f. 63 ...	P. trichoglossa ...	East Himalaya.
	P. Prainiana ...	Ditto ditto, t. 3, f. 66 ...	P, Prainiana ...	East Himalaya.
	P. microcalyx ...	Ditto ditto, t. 4, f. 71 ...	P. microcalyx ...	East Himalaya.
	P. dolichorrhiza ...	Ditto ditto, t. 4, f. 80, and t. 6, f. 146.	*P. cabulica* and P. dolichorrhiza.	Afghanistan and Siberia.
	P. alaschanica ...	Ditto ditto, t. 5, f. 86 ...	P. alaschanica ...	North Tibet.
	P. fragilis ...	Ditto ditto, t. 5, f. 93 ...	P. fragilis ...	Assam.
	P. globifera ...	Ditto ditto, t. 5, f. 95 ...	P. globifera ...	East Himalaya.
	P. ophiocephala ...	Ditto ditto, t. 5, f. 94 ...	P. ophiocephala ...	West Himalaya.
	P. comptoniæfolia ...	Ditto ditto, t. 5, f. 96 ...	P. comptoniæfolia	Yunnan.
	P. rex ...	Ditto ditto, t. 5, f. 103 ...	P. rex ...	Assam.
	P. polygaloides ...	Ditto ditto, t. 5, f. 110 ...	P. polygaloides ...	East Himalaya.
	P. Roylei ...	Ditto ditto, t. 4, f. 122 ...	P. Roylei ...	West Himalaya.
	P. pycnantha ...	Ditto ditto, t. 4, f. 127, 129 ...	P. pycnantha and *P. Semenowi.*	Persia and Siberia.
	P. mollis ...	Ditto ditto, t. 4, f. 126 ...	P. mollis ...	Nepal.
	P. Kingii ...	Ditto ditto, t. 4, f. 131 ...	P. Kingii ...	Sikkim.
	P. lyrata ..	Ditto ditto, t. 4, f. 134 ...	P. lyrata ...	East Himalaya.
	P. Oederi ...	Ditto ditto, t. 7, f. 177 ...	*P. versicolor* ...	Arctic Regions.

The names of the chief contributors to our knowledge of the Indian species of the genus will be found in TABLE XVII, column 5. Four collections have been issued independently and without descriptions; these are (1) *Herb. Wallich;* (2) *Herb. Griffith;* (3) *Herb. Wight;* (4) *Herb. Ind. Or. H. f. & T. T.* No reductions are necessary in the case of the last two; those that are necessary in the others are given in the subjoined tables:—

TABLE XXII.—*Reductions of the Griffithian species.*

Issued number.	Griff. number.	Journey.	Issued name.	True name.
3939	1060	Afghan 1st year ...	P. Elephas *Boiss.* ...	P. rhinanthoides *Schrenk.*
3939-1	631	Bootan	P. gracilis *Wall.* ...	P. gracilis *Wall.*
——	742	Khasyah	——	P. gracilis *Wall.* VAR. khasiana *Hk. f.*
3940	——	? Mishmi	P. flagellaris *Bth.* ...	P. flagellaris *Bth.*
3941	1143	Afghan 1st year ...	—— ...	P. dolichorrhiza *Schrenk.*
——	157	Afghan 2nd year ...	—— ...	P. dolichorrhiza *Schrenk.*
——	165	Ditto	—— ...	P. siphonantha *Don* VAR. brevituba *Prain.*

TABLE XXIII.—*Reductions of the Wallichian Herbarium.*

Cat. number.	Wallichian name.	True name.	REMARKS.
411	P. megalantha *Don*	P. megalantha *Don* ...	411-12=syn. *P. Hoffmeisteri* Kl.
412	P. furfuracea *Wall.* ...	P. furfuracea *Wall.*	
413	P. gracilis *Wall.*	P. gracilis *Wall.*	
414	P. stricta *Wall.*	P. gracilis *Wall.* VAR. typica ...	A distinct *form*, but not separable as a variety.
415	P. mollis *Wall.*	P. mollis *Wall.*	
416A	P. asplenifolia *Wall.* ...	P. Wallichii *Bunge.*	
416B	"an eadem sp?" ...	P. Oederi *Vahl* VAR. heteroglossa *Prain.*	
417	P. siphonantha *Don* ...	P. siphonantha *Don* VAR. typica.	
418A	P. carnosa *Wall*	P. carnosa *Wall.*	
418B	Torenia incisa *Heyne* ...	P. zeylanica *Benth.*	
419	P. lanigera *Wall.*	P. brevifolia *Don;* (P. carnosa *Wall.*).	419 at the Linn. Soc. Rooms, at Kew and at St. Petersburg is *P. brevifolia*, but at Calcutta is the densely woolly state of *P. carnosa* met with in Kamaon.
420	P. pectinata *Wall.*	P. pectinata *Wall.*	
421	P. Hookeriana *Wall.* ...	P. siphonantha *Don* VAR. typica	A distinct *form*, but not separable as a variety.
422	P. Brunoniana *Wall.* ...	P. gracilis *Wall.* VAR. typica ...	Simply a prostrate *state* of form "stricta."
423	P. porrecta *Wall.*	P. porrecta *Wall.*	

The conspectus of affinities of the Indian species in the next chapter is based on an examination of 184 species preserved in the Calcutta Herbarium, but it could not have been made so complete had it not been for the existence of the two synopses of the genus, already so frequently quoted, prepared by Mr. Maximowicz in 1877 and 1888 respectively. These two articles are so excellent that after the closest study one is left in doubt whether to admire most the minuteness of description and fidelity to detail that they display, or the keen appreciation of affinities and clearness of exposition that characterise them.

In this conspectus there are here and there instances of a slightly different disposition of individual species. This is to some extent due to the present conspectus having been mainly drawn up before the appearance of Mr. Maximowicz's newer synopsis. And so because Mr. Maximowicz's revision is of such a nature that any attempt to supplement it or proposal to alter it might easily become an impertinence, also because an independent complementary view may prove of some use to other students of the genus, but not because the present arrangement claims to be more natural than that of Mr. Maximowicz, nor because it is not open to modification in many places, it is issued practically as it stood before the appearance of Mr. Maximowicz's paper of 1888. The Indian species are indicated by a heavier type.

CHAPTER VI.—CONSPECTUS AFFINITATUM.

Species Indicæ typis Ionicis imprimantur.

PEDICULARIS Linn.

Calyx ovatus campanulatus vel tubulosus sæpissime antice et interdum postice fissus apice 2—5-dentatus dentibus raro æqualibus lateralibus connatis vel liberis margine dentatis postico sæpius minore integerrimo nonnunquam deficiente. Corollæ tubus æqualis vel sursum ampliatus; limbus 2-labiatus labio antico basi suberecto supra 2-cristato vel subsessili ecristato lobis 3 sæpius patentibus vel deflexis nonnunquam æquilatis intermedio tamen sæpius minore rarissime majore, postico basi tubo continuo erecto rarissime sessili in galeam ad antheras fovitum compressam producto, galea aut erostri et antice integra vel sub apice utrinque dentata aut in rostrum gracile robustumve apice acutum truncatumve integrum vel emarginatum 2-dentatum 2-fidumve abeunti. Stamina 4, didynama sub galea ascendentia, filamentis omnibus anticisve tantum hirsutis vel omnibus glabris; antheræ transversæ per paria approximatæ loculis distinctis æqualibus parallelis basi muticis vel rarius aristatis. Stylus apice integer subcapitato-stigmatosus; ovula amphitropa in quoque loculo 4—∞ ; (sæpissime indefinita). Capsula compressa ovata vel ovato-lanceolata, sæpissime plus minus obliqua et sæpe rostrata, loculicide dehiscens valvis medio septiferis placentas ferentibus sed sæpe diu ultra medium cohærentibus. Semina in parte inferiore, numero sat variabilia, ovata vel oblonga recta vel curva rarissime sphærica, testa laxa vel adpressa perforate reticulata vel foveolata striata vel multicostata.

Herbæ perennes rarius forsan annuæ semiparasiticæ vel rarissime semisaprophyticæ. Folia alterna subopposita opposita vel 3—5-natim verticillata semel pluriesve pinnatim divisa rarius simpliciter dentata rarissime crenata floralia decrescentia pleraque bracteiformia. Rhizoma sæpe collo squamis coronatum. Flores sæpius centripeto nonnunquam tamen centrifugo ordine aperti ad apices ramorum caulisque spicatim vel subcapitatim conferti vel pedicellis evolutis racemosi sæpe secundi, ebracteolati.

I.—LONGIROSTRES.

Corollæ tubus rectus labium amplum sessile tenerum galea coriacea longirostris rarissime erostris. *Longirostres* Maxim., Mel. Biol. x, 80 (1877).

§ SIPHONANTHÆ.

Corollæ tubus tenuis vel cylindricus calyce fere semper sed sæpius pluries longior, galea in 1. erostris in reliquis longirostris rostro apice in alabastro ad faucem corollæ versus spectante dorso labium medianum attingente. Filamenta sub fauce vel paulo dimissius rarissime fere medio tubo inserta. Folia sæpissime alterna; in 3. opposita. Flores racemosi inferiores semper sero et forsan centrifugo ordine aperti. *Siphonanthæ* Benth., Scroph. Ind. 53 (1835).

Species fere omnes Himalaico-Yunnanenses, paucæ etiam Tibeto-Sinenses, 2. quidem in provincia Sibirica obviæ 1. etiam usque ad Persiam excurrens.

A.—*Eusiphonanthæ*:—Corollæ tubus tenuis æqualis calyce multoties longior, filamenta (*P. Perrottetii* exceptis) ipso apice tubi inserta: calyx (*P. muscicolæ* excepto) antice fissus. Folia alterna.

1. Rhinanthoides.

P. rhinanthoides *Schrenk; Enum. Pl. Nov.* i, 22.
P. Delavayi *Franchet*; *Maxim., Mel. Biol.* xii, 791.

Nanæ vel elatæ glabræ vel parce pilosæ foliis lineari-oblongis radicalibus longe petiolatis segmentis ovatis, calycis ovati 5-dentati segmento summo lanceolato vel subulato integro reliquis ovatis mucronato-dentatis.

Galeæ parte erecta longiore, labio margine eciliato lobis omnibus rotundatis rostro apice integro, filamentis anticis tantum villosis .	*P. rhinanthoides.*
Galeæ parte erecta abbreviata, labio margine ciliato lobo medio emarginato rostro apice bifido, filamentis omnibus villosis . . .	*P. Delavayi.*

2. Longifloræ.

P. bidentata *Maxim.; Mel. Biol.* xii, 795.
P. armata *Maxim.; Mel. Biol.* x, 86.
P. cranolopha *Maxim.; Mel. Biol.* x, 85.
P. chinensis *Maxim.; Mel. Biol.* x, 87.
P. longiflora *Rudolph; Mem. Acad. St. Petersb.* iv, 345.
P. sigmoidea *Franchet; Maxim., Mel. Biol.* xii, 796.
P. siphonantha *Don; Prodr. Flor. Nepal.* 95.
P. strobilacea *Franchet; Hemsl., Jour. Linn. Soc.* xxvi, 216.

Nanæ vel elatæ pilosæ foliis lineari-oblongis radicalibus longe petiolatis segmentis ovatis lanceolatisve calycis ovati 2—3-dentati segmento summo (*P. strobilaceæ* excepto) lanceolato vel deficiente reliquis ovatis varie dentatis.

Calyce ad normam 2-dentato; galea ecristata labio margine iliato lobis omnibus rotundatis filamentis omnibus hirsutis:—

rostro ferri equini ad instar apice integro; corolla ochroleuca . . .	*P. bidentata.*
rostro tenui sigmoideo apice emarginato; corolla lutea	*P. armata.*

Calyce ad normam 3-dentato:—

calycis dente summo subulato apice integro:—

galea cristata, labio margine eciliato lobo medio emarginato rostro sigmoideo apice 2-fido filamentis omnibus hirsutis; corolla lutea *P. cranolopha.*

galea ecristata, labio margine ciliato:—

filamentis omnibus hirsutis:—

labio lobo medio emarginato, rostro circinnato apice integro; corolla lutea . . . . . *P. chinensis.*

labio lobis omnibus emarginatis, rostro circinnato, apice 2-fido; corolla lutea . . . . . *P. longiflora.*

labio parce ciliato lobo medio emarginato, rostro sigmoideo apice integro; corolla purpurea . . . . *P. sigmoidea.*

filamentis anticis tantum hirsutis, labio lobo medio emarginato rostro circinnato apice 2-fido; corolla punicea . . . *P. siphonantha.*

calycis dente summo reliquis apice foliaceo . . . . . *P. strobilacea.*

3. Megalanthæ.

P. bicornuta *Klotzsch; Reis. Pr. Wald., Bot.* 109.
P. elephantoides *Benth.; Scroph. Ind.* 53.
P. megalantha *Don; Prodr. Flor. Nepal.* 94.

Erectæ simplices (pluricaulis ascendens *P. megalantha* VAR. *pauciflora*) pubescentes vel glabratæ foliis ovatis lanceolatisve petiolatis segmentis oblongo-obtusis, calycis oblongi vel globosi 5-dentati segmentis omnibus serrato-dentatis postico reliquis minore; labio eciliato, lobo medio oblongo.

Filamentis omnibus glabris margine crenulatis, galeæ parte basali erecta:—

galea fauce contorta, rostro decurvo apice profunde 2-partito segmentis acutis . . . . . *P. bicornuta.*

galea fauce plana, rostro rectiusculo longissimo apice resupinato integro . . . . . *P. elephantoides.*

Filamentis anticis hirsutis galeæ parte basali subreflexa rostro circinnato apice breviter 2-lobo segmentis obtusis . . . . . *P. megalantha.*

4. Muscicolæ.

P. muscicola *Maxim.; Mel. Biol.* x, 84.
P. macrosiphon *Franchet; Pl. David.* ii, 104: n. 253.
P. Perrottetii *Benth.; DC., Prodr.* x, 565.

Procumbentes ramosæ parce hirsutæ foliis ellipticis vel lanceolatis pinnatipartitis sectisve segmentis oblongis lanceolatisve profunde dentatis calyce cylindrico-campanulato 5-dentato, labio margine eciliato, filamentis glabris.

Calycis integri dentibus supparibus lineari-lanceolatis galea subsessili rostro circinnato apice emarginato; foliorum segmentis petiolulatis . *P. muscicola.*

Calycis antice fissi dente summo reliquis minore; foliorum segmentis e lata basi sessilibus:—

galea falcata in rostrum porrectum attenuata filamentis apice tubi insertis . . . . . *P. macrosiphon.*

galea lata erecta erostri filamentis inter medium et apicem tubi insertis . . . . . *P. Perrottetii.*

5. Pumiliones.

P. bella *Hook. fil.; Flor. Brit. Ind.* iv, 313.
P. Przewalskii *Maxim.; Mel. Biol.* x, 84.

Nanæ subacaules cano-villosæ foliis cæspitosis petiolatis anguste oblongis obtusis segmentis ovatis crenatis, calycis cylindrico-campanulati herbacei 5-dentati segmento postico subintegro reliquis ovatis serratis minore corollæ tubo extus puberulo, labio margine eciliato, filamentis omnibus hirsutis.

Galea vix inflata rostro sigmoideo baculi episcopalis ad instar apice resupinato emarginato, labii lobo medio ovato minimo . . . . . *P. bella.*
Galea subinflata rostro porrecto apice 2-partito segmentis obtusis labii lobis supparibus medio emarginato . . . . . *P. Przewalskii.*

B.—*Brevitubæ:*—Corollæ tubus cylindricus apice subito ampliatus calycem vix excedens, galea plus minus inflata, filamenta fere medio tubo inserta: calyx antice fissus. Folia alterna.

6. Robustæ.

P. Daltoni *Prain; Jour. As. Soc. Beng.* lviii, 2, 270.
P. Garckeana *Prain; Maxim., Mel. Biol.* xii, 788
P. robusta *Hook. fil.; Flor. Brit. Ind.* iv, 306.
P. nepalensis *Prain; Jour. As. Soc. Beng.* lviii, 2, 268.

Humiles vel raro elatæ sæpissime pubescentes pluricipites foliis petiolatis anguste oblongis obtusis pinnatifidis segmentis oblongis mucronato-dentatis, calycis cylindrico-campanulati herbacei 5-dentati segmento postico subintegro reliquis ovatis serratis minore, corollæ tubo extus puberulo, rostro apice profunde segmentis acutis 2-fido, labio margine eciliato, filamentis omnibus hirsutis; pedicellis fructigeris valde elongatis.

Galeæ parte basali reflexa, rostro porrecto subhorizontali, labio margine crenulato lobis rotundatis medio minore: tubo calyce dimidio longiore . . . . . *P. Daltoni.*

Galeæ parte basali erecta, rostro deorsum spectante:—

rostro circinnato, labio margine integro lobo medio cuneato-oblongo prominente: tubo calyce dimidio longiore . . . . . *P. Garckeana.*
rostro ad perpendiculum directo versus apicem paulum adunco labio margine integro lobis rotundatis supparibus: tubo calycem vix æquante . . . . . *P. robusta.*
rostro ad perpendiculum directo subrecto labio margine crenulato lobis omnibus truncatis medio reliquis minore: tubo calyce 2-plo longiore . . . . . *P. nepalensis.*

7. Macranthæ.

P. macrantha *Klotzsch; Reis. Pr. Wald., Bot.* 108.
P. Scullyana *Prain; Maxim., Mel. Biol.* xii, 789.
P. Elwesii *Hook. fil.; Flor. Brit. Ind.* iv, 312.

Elatæ vel raro humiles plus minus pilosæ foliis lanceolatis longepetiolatis segmentis pinnatifidis -partitisve lanciniis dentatis, calyce ovato 5-dentato antice fisso, corollæ tubo calycem vix æquante rostro segmentis acutis 2-fido; filamentis omnibus hirsutis.

Calyce recto ad medium fisso dentibus subæqualibus ovatis serrato-dentatis ; labio margine eciliato :—

galea rostro dimidio longiore basi erecta, labii lobo medio lateralibus æquilato . . . . . *P. macrantha.*

galea rostro 3-plo longiore basi subreflexa, labii lobo medio lateralibus 3-plo minore . . . . . *P. Scullyana.*

Calyce obliquo fere ad basin usque fisso dente postico subulato integro vel apice serrato, lateralibus ovatis serrato-dentatis (nonnunquam uno latere vel utrinque conjunctis), labio margine longissime ciliato; galea rostro æquilonga basi abrupte reflexa, labii lobo medio emarginato lateralibus 2-plo minore . . . . . *P. Elwesii.*

C.—*Oppositifoliæ* :—Corollæ tubus tenuis æqualis calycem æquans vel excedens, filamenta apice tubi inserta. Folia opposita.

8. Integrifolia.

P. integrifolia *Hook. fil; Flor. Brit. Ind.* iv, 30.8

Humilis pubescens pauciflora foliis anguste oblongis margine crenulatis radicalibus cæspitosis, calycis sessilis coriacei cylindrico-campanulati 5-dentati antice triente fissi segmentis supparibus oblongis crenatis; filamentis omnibus hirsutis; labio margine eciliato.

Galea inflata rostro tenui basi porrecto demum circinnato apice obtuso integro; tubo calyce dimidio longiore . . . . . *P. integrifolia.*

9. Gyrorrhyncha.

P. gyrorrhyncha *Franchet ; Maxim., Mel. Biol.* xii, 812.

Stricta simplex vel ramosa villosula foliis oppositis ternisve brevipetiolatis oblongo-lanceolatis pinnatipartitis laciniis oblongis pinnatilobis, calycis brevis tubulosi hirsuti 5-dentati integri dente summo integro reliquis mucronato-dentatis minore; filamentis omnibus hirsutis; labio margine ciliato.

Galea subsessili rostro tenui circinnato apice integro; tubo calyce subduplo longiore . . . . . *P. gyrorrhyncha.*

10. Franchetiana.

P. Franchetiana *Maxim.; Mel. Biol.* xii, 823.

Nana ramosissima foliis parvulis petiolatis segmentis ovatis dentatis calycis ovati membranacei antice profunde fissi 2-dentati segmentis late deltoideis 3-fidis et inciso-dentatis; filamentis anticis tantum hirsutis; labio margine ciliato; pedicellis longissimis.

Galea subsessili rostro tenui dependente apice integro; tubo calycem æquante . . . . . *P. Franchetiana.*

§§ Orthorrhynchæ.

Corollæ tubus tenuis calycem æquans vel sæpius plus minus excedens, galea rostrata rostro recto vel flexuoso apice in alabastro marginem lobi centralis attingente dorso a labio mediano averso. Filamenta prope a medio tubo vel sæpe paulo altius nonnunquam tamen ex adverso summi ovarii inserta. Folia opposita. Flores sæpissime racemosi centripeto ordine aperti. Calyx 5-dentatus (in 1. 2-dentatus).

Species fere omnes provinciæ Himalaico-Yunnanensis incolæ, paucæ etiam in provincia Tibeto-Sinense obviæ, 2. quidem usque ad Sibiricam 1. usque ad Japonicam excurrentes.

A.—*Tenuirostres*:—Corollæ tubus tenuis calycem vix superans, rostrum tenue elongatum sæpissime curvatum. Folia rite verticillata. Flores spicati, bracteæ saltem summæ foliis longe diversæ.

11. Pectinatæ.

P. pectinata *Wall.*; *Cat.* 420.
P. tenuirostris *Benth.*; *DC., Prodr.* x, 561.
P. pyramidata *Royle*; *Benth., Scroph. Ind.* 52.
P. Fetisowi *Regel*; *Act. Hort. Petrop.* vi, 349.
P. Alopecuros *Franchet*; *Maxim., Mel. Biol.* xii, 816.

Elatæ strictæ simplices vel caule parce breve ramoso ramis strictis foliis ovato-lanceolatis pinnatifidis -partitisve spicis elongatis densis vel basi breve interruptis, bracteis ovatis integris vel apice tantum serratis calyce ovoideo paulo usque ad trientem fisso; capsula ovata parum exserta.

Calyce dentibus supparibus integris; filamentis omnibus hirsutis:—
corollæ tubo calycem æquante filamentis basi pilosis in sacculo transverso ex adverso summi ovarii insertis:—
foliis 2-pinnatipartitis, petiolatis, spicis interruptis floribus roseis — *P. pectinata.*
foliis pinnatifidis laciniis dentatis, sessilibus, spicis bracteis arcte imbricatis congestis, floribus luteis . . . . . — *P. tenuirostris.*
corollæ tubo calyce ½ longiore filamentis basi glabris medio tubo insertis; foliis 2-pinnatipartitis, petiolatis, spicis basi tantum interruptis, floribus roseis . . . . . — *P. pyramidata.*
Calyce dente summo nano integro; filamentis omnibus glabris:—
corollæ tubo calyce breve exserto foliis 2-pinnatipartitis petiolatis, spicis basi interruptis, calyce dentibus lateralibus subintegris, galea cristata rostro curvato labio parvo . . . . . — *P. Fetisowi.*
corollæ tubo calycem vix æquante, foliis pinnatifidis laciniis dentatis sessilibus, spicis bracteis arcte imbricatis congestis, calyce dentibus lateralibus ovatis serratis, galea cristata, rostro recto labio rostro æquilongo . . . . . — *P. Alopecuros.*

12. Semitortæ.

P. Oliveriana *Prain*; *Jour. As. Soc. Beng.* lviii, 2, 257.
P. Scolopax *Maxim.*; *Mel. Biol.* xi, 282.
P. tianschanica *Rupr.*; *Sert. Tiansch.* 63.
P. Roborowskii *Maxim.*; *Mel. Biol.* xi, 281.
P. semitorta *Maxim.*; *Mel. Biol.* xii, 813.
P. cristata *Maxim.*; *Mel. Biol.* xii, 814.

Elatæ strictæ pluricaules foliis pinnatisectis -partitisve spicis elongatis interruptis bracteis lanceolatis serratis vel laciniatim 3—5-partitis calyce ovato vel campanulato filamentis medio tubo vel paulo altius insertis, capsula ovato-lanceolata calyce longiore.

Bracteis lanceolatis serratis; calyce nec fisso dentibus lanceolatis:—

calyce campanulato dentibus serratis rostro semicirculari deflexo, filamentis glabris, floribus roseis . . . . . *P. Oliveriana.*

calyce ovato-inflato dentibus alternis integris rostro porrecto, filamentis anticis hirsutis, floribus flavis . . . . . *P. Scolopax.*

Bracteis, saltem summis, laciniatim 3—5-fidis;

calyce ovato antice fisso:—

calyce dentibus summo nano integro excepto serratis, rostro convoluto, filamentis omnibus hirsutis, floribus flavis . . . *P. tianschanica.*

calyce dentibus omnibus integris lanceolatis:—

rostro tenui recto apice recurvo, filamentis glandulose punctatis, floribus luteis . . . . . *P. Roborowskii.*

rostro semicirculari, filamentis anticis hirsutis, floribus flavis *P. semitorta.*

calyce ovoideo, nec fisso; dentibus triangularibus integris summo minore, galea cristata rostro tenui deflexo, filamentis anticis hirsutis, floribus roseis . . . . . *P. cristata.*

B.—*Euorthorrhynchæ:*—Corollæ tubus tenuis calycem vix superans rostrum tenue elongatum rectum. Folia verticillata vel opposita. Flores dense racemosi, bracteæ foliiformes sæpissime sessiles: calyx nec fissus.

13. Brevifoliæ.

P. brevifolia *Don; Prodr. Flor. Nepal.* 94.

P. instar *Prain; Maxim., Mel. Biol.* xii, 815.

Elongatæ vel humiles graciles sæpissime simplices foliis 3—4-natim verticillatis verticillis foliorum florumque distantibus foliis oblongis pinnatifidis laciniis breve ovatis calyce campanulato dentibus majusculis ovatis dentatis filamentis medio tubo insertis omnibus glabris, capsula ovata oblique acuminata parum exserta.

Labio 3-fido, rostro apice emarginato . . . . . *P. brevifolia.*

Labio 3-partito, rostro apice integerrimo . . . . . *P. instar.*

14. Gracilis.

P. gracilis *Wall.; Cat.* 413.

Elongata erecta gracilis semel iterumque paniculato-ramosa foliis 2—4-natim verticillatis oblongis pinnatifidis laciniis breve ovatis calyce tubuloso margine sinuato-dentato vel dentibus brevissimis, filamentis paulo medio tubo demissius insertis omnibus glabris, capsula ovata recte acuminata parum exserta.

Labio 3-lobo, rostro apice integerrimo . . . . . *P. gracilis.*

15. Debiles.

P. Heydei *Prain; Jour. As. Soc. Beng.* lviii, 2, 258.
P. porrecta *Wall.; Cat.* 423.
P. villosula *Franchet; Hemsl., Jour. Linn. Soc.* xxvi, 220.
P. confertiflora *Prain; Jour. As. Soc. Beng.* lviii, 2, 258.
P. debilis *Franchet; Maxim., Mel. Biol.* xii, 817.
P. verbenæfolia *Franchet; Maxim., Mel. Biol.* xii, 818.

Humiles e basi cæspitose ramosæ foliis radicalibus cæspitosis caulinis paucis oppositis remotis racemis paucifloris foliis oblongis (in 1. lanceolatis) pinnatifidis laciniis breve ovatis calyce campanulato filamentis supra medium tubum insertis capsula ovata parum exserta.

Foliis lanceolatis calyce dentibus supparibus serratis, labio parvo margine glabro, filamentis glabris . . . . . *P. Heydei.*

Faliis ovatis:—

calyce dentibus lateralibus majoribus et omnibus summo nano excepto serratis:—

labio majore margine glabro, filamentis glabris . . . . *P. porrecta.*

(labio nondum descripto), filamentis anticis hirsutis . . . . *P. villosula.*

calyce dentibus summo acuto excepto 3-dentatis:—

labio margine glabro, filamentis glabris . . . . . *P. confertiflora.*

labio margine glabro, filamentis anticis hirsutis . . . . *P. debilis.*

labio margine ciliato, filamentis anticis hirsutis . . . . *P. verbenæfolia.*

C.—*Axillares*:—Corollæ tubus tenuis calyce sæpissime plus minus longior rostrum tenue elongatum rectum; folia opposita. Flores racemosi, bracteæ foliiformes petiolatæ.

16. Flexuosæ.

P. moupinensis *Franchet; Pl. David.* ii, 105: n. 255.
P. flexuosa *Hook. fil; Flor. Brit. Ind.* iv, 308.
P. chumbica *Prain; Jour. As. Soc. Beng.* lviii, 2, 259.
P. tenuicaulis *Prain; Jour. As. Soc. Beng.* lviii, 2, 259.
P. Keiskei *Franch. et Savat.; Enum. Pl. Japon.* ii, 459.

Elatæ (1 species nana) pluricaules glabratæ vel pubescentes foliis ovato-lanceolatis 2-pinnatipartitis oppositis vel verticillatis, calyce antice parum (in 1. profunde) fisso breve pedicellato corollæ tubo sæpissime calycem excedente filamentis medio tubo insertis capsula ovato-lanceolata calycem longe excedente; calyce in 1. 2-dentato.

Foliis 3—4-natim verticillatis: floribus perpaucis calycis dentibus brevibus integris, tubo calycem vix æquante rostro recurvo apice emarginato, filamentis anticis hirsutis . . . . . *P. moupinensis.*

Foliis oppositis; rostro porrecto:—

calyce dentibus summo nano excepto ovatis serratis corollæ tubo calyce multoties longiore:—

rostro apice emarginato filamentis anticis hirsutis . . . *P. flexuosa.*

rostro apice integro filamentis glabris; planta nana . . *P. chumbica.*

calyce dentibus omnibus lanceolatis integris, corollæ tubo calyce $\frac{1}{2}$ longiore, rostro apice integro, filamentis anticis hirsutis . . . . . *P. tenuicaulis.*

calyce 2-*dentato*, segmentis triangularibus integris corollæ tubo calyce 2-plo longiore, rostro apice emarginato, filamentis anticis hirsutis . . . . . *P. Keiskei.*

16*b*. Filicifolia.

P. filicifolia *Hemsl.; Jour. Linn. Soc.* xxvi, 208.

Procumbens ramosa glabra foliis ellipticis pinnatisectis oppositis segmentis ovatis oblongisve inciso-serratis petiolulatis calyce cylindrico-campanulato, labio margine ciliato, filamentis longius supra medium tubum insertis, glabris.

Tubo calycem vix æquante rostro subrecurvo, calyce dentibus summo nano 3-dentato excepto ex integra basi rotundatis cristatis . . . . *P. filicifolia.*

17. Longipedes.

P. longipes *Maxim.; Mel. Biol.* xii, 824.
P. axillaris *Franchet; Maxim., Mel. Biol.* xii, 825.

Humiles pluricaules puberulæ foliis oblongo-lanceolatis pinnatisectis segmentis pinnatifidis oppositis, vel caulinis alternis, calyce campanulato nec fisso longissime pedicellato dentibus lanceolatis supparibus, corollæ tubo calycem paulo excedente, labio margine ciliato filamentis infra medium tubum insertis omnibus glabris.

Calycis dentibus subintegris rostro porrecto apice emarginato . . *P. longipes.*
Calycis dentibus serrato-dentatis rostro tenui apice decurvo integro *P. axillaris.*

II.—ADUNCÆ.

Corollæ tubus sæpissime incurvus cylindricus sursum paulum ampliatus, labium sessile amplum vel stipitatum 2-cristatum tenerum galea coriacea rostrata vel erostris.

§§§ RHYNCHOLOPHÆ.

Corollæ tubus calycem æquans vel paulo excedens galea rostrata rostro crassiusculo apice in alabastro ad labium medianum apposito, in 11 speciebus omnino deficiente, labium sæpius amplum sessile et quum stipitatum tum cristis sæpissime inchoatis. Filamenta sæpissime infra medium tubum et sæpius ex adverso summi ovarii inserta. Folia sæpissime alterna; in 4. opposita. Flores sæpissime spicati et semper ordine centripeto aperti. *Rhyncholopha* Bunge; Ledeb. Flor. Ross. iii, 277 (1846).

Species regionis borealis arctico-alpinæ totius incolæ in provinciâ quidem Sibiricâ et in Caucasicâ quam in reliquis simpliciter et comparate multo pauciores.

A.—*Hyposiphonanthæ*:—Corollæ tubus rectus tenuior æqualis vel sursum plus minus ampliatus calycem æquans vel dimidio duplove excedens labium sessile rostrum gracile vel deficiens filamenta in 1 specie apice tubi in 3. medio tubo in reliquis ex adverso summi ovarii inserta: calyx 2—5-dentatus antice (1 speciei excepto) fissus. Folia alterna: flores (1 specie floribus spicatis excepta) interrupte racemosi.

18. Oxycarpæ.

P. torta *Maxim.; Mel. Biol.* xii, 801.
P. Davidi *Franchet; Plant. David.* ii, 105 : n. 256.
P. oxycarpa *Franchet; Maxim., Mel. Biol.* xii, 804.
P. macilenta *Franchet; Hemsl., Jour. Linn. Soc.* xxvi, 212.

Erectæ simplices vel e basi cæspitoso-pluricaules foliis elliptico-lanceolatis pinnatisectis segmentis pinnatifidis et mucronato-dentatis bracteis tenue petiolatis foliaceis summis

3-sectis calyce membranaceo cylindrico-campanulato semi-fisso 3-dentato, corollæ tubo æquali extus puberulo labio margine ciliato, capsula longiuscula acute lanceolata longe exserta.

Labio lobo medio prominente, rostro gracillimo, filamentis omnibus hirsutis:—
- calycis dentibus serratis lateralibus ovatis summo lanceolato tubo calyce ½ longiore galea cristata basi torta filamentis fere apice tubi insertis; foliis basi caulis aggregatis . . . . . *P. torta.*
- calycis dentibus oblongis integris tubo calyce 2-plo longiore galea ecristata rostro basi torto filamentis triente superiore tubi insertis foliis secus caulem sparsis passim oppositis vel ternis . . . *P. Davidi.*

Labio lobo medio minimo tubo calycem parum excedente:—
- calycis dentibus subulatis integris, rostro cristato sensim attenuato filamentis triente superiore tubi insertis omnibus hirsutis; caulibus a basi foliatis . . . . . *P. oxycarpa.*
- calycis dentibus serratis, rostro porrecto filamentis infra medium tubum insertis glaberrimis; planta annua e collo unicaulis . . . *P. macilenta.*

19. Furfuraceæ.

P. furfuracea *Wall.; Cat.* 412.
P. Pantlingii *Prain; Jour. As. Soc. Beng.* lviii, 2, 273.
P. microcalyx *Hook. fil.; Flor. Brit. Ind.* iv, 315.

Erectæ simplices vel e basi pluricaules foliis majusculis longe petiolatis ovatis vel lanceolatis pinnatifidis vel tantum lobatis segmentis subintegris bracteis petiolatis foliaceis calyce membranaceo ovato vel campanulato 5-dentato, corollæ tubo æquali extus glabro rostro apice 2-fido, capsula longuiscula acute lanceolata longe exserta.

Foliorum laminis oblongo-ovatis, calycis dentibus supparibus; rostri segmentis utrinque emarginatis; filamentis ex adverso summi ovarii insertis:—
- calyce glabro antice ⅔-fisso ovato dentibus integris parvulis nonnunquam deficientibus labio margine eciliato lobis emarginatis lateralibus medio 2-plo majoribus apicis versuris exterioribus majoribus ovatis; filamentis glabris: foliis pinnatifidis . . . *P. furfuracea.*
- calyce hirsuto nec fisso campanulato dentibus majusculis ovatis serratis labio margine ciliato lobis integris lateralibus medio 3-plo majoribus apicis versuris exterioribus minutis acutis; filamentis anticis puberulis: foliis subintegris . . . . . *P. Pantlingii.*

Foliorum laminis lanceolatis pinnatifidis; calycis campanulati glabri antice semifissi dentibus lanceolatis apice (summo breviore excepto) serratis labio margine ciliato lobis integris lateralibus medio 2-plo majoribus rostri segmentis integris acutis, filamentis medio tubo insertis omnibus glabris . . . . . *P. microcalyx.*

20. Oliganthæ.

P. cephalantha *Franchet; Maxim., Mel. Biol.* xii, 805.
P. longepetiolata *Franchet; Maxim., Mel. Biol.* xii, 806.
P. oligantha *Franchet; Maxim., Mel. Biol.* xii, 808.

Pluricaules glabratæ foliis majusculis longe petiolatis oblongis vel oblongo-lanceolatis pinnatisectis segmentis oblongis serratis calyce campanulato antice semifisso 3- vel 5-dentato

corollæ tubo æquali calycem parum excedente galea margine utrinque 1-dentata rostro porrecto vel apice arcuato attenuata labio lobo medio lateralibus 3-plo minore filamentis paulo supra medium tubum insertis capsula ovato-oblonga calyce sesquilongiore: foliis inferioribus in 1 specie oppositis.

Foliis inferioribus oppositis, floribus spicatis; calyce 5-dentato segmentis 2 lanceolatis serratis 3 subulatis integris galea gibba dentibus distinctissimis inflexis subito in rostrum abeunti, labio margine eciliato filamentis anticis hirsutis . . . . . *P. cephalantha.*

Foliis omnibus sparsis, floribus racemosis:—

calyce 5-dentato segmentis lanceolatis serratis galea dentibus lanceolatis retroflexis labio margine eciliato filamentis anticis hirsutis . . . . . *P. longepetiolata.*

calyce 3-dentato segmentis lateralibus ovatis serratis summo minimo integerrimo galea dentibus ovatis majusculis obtusis labio margine longe ciliato, filamentis omnibus glabris . . *P. oligantha.*

21. Microphyllæ.

P. polyphylla *Franchet; Maxim., Mel. Biol.* xii, 809.
P. gruina *Franchet; Maxim., Mel. Biol.* xii, 799.
P. flagellaris *Benth.; DC., Prodr.* x, 561.
P. Henryi *Maxim.; Mel. Biol.* xii, 833.
P. tenuisecta *Franchet; Maxim., Mel. Biol.* xii, 831.

Strictæ sursum fastigiatim vel e basi diffuse ramosæ pubescentes polyphyllæ foliis parvulis breve petiolatis laminis oblongis pinnatipartitis segmentis cartilagineo-serratis, calycis campanulati 5-dentati dentibus omnibus flabellato-rotundatis inciso-serratis; filamentis omnibus hirsutis; capsula ovata parum exserta.

Calyce vix $\frac{1}{3}$ fisso, corollæ tubo recto, galea rostrata:—

tubo æquali calyce $\frac{1}{2}$ longiore galea angulo recto incurva rostro porrecto apice integro tantum decurvo labio lobo medio lateralibus multo minore, filamentis medio tubo insertis:—

labio margine ciliato galeæ parte erecta utrinque dentata . . . *P. polyphylla.*

labio margine eciliato galeæ parte antherigera utrinque dentata . *P. gruina.*

tubo sursum ampliato calyce 2-plo longiore galea arcuata rostro brevi horizontali apice 2-fido labio margine eciliato lobo medio lateralibus vix $\frac{1}{2}$ minore filamentis ex adverso summi ovarii insertis . . . . . *P. flagellaris.*

Calyce semifisso, corollæ tubo incurvo sursum ampliato, galea erostri, filamentis ex adverso summi ovarii insertis:—

tubo calyce vix $\frac{1}{2}$ longiore galea recta tantum apice aduncа brevissime subrostrata 2-fida labio margine eciliato lobo medio lateralibus plus 2-plo minore . . . . . *P. Henryi.*

tubo calyce fere 2-plo longiore galea fronte verticali angulo inferiore truncata labio margine ciliato lobis subæquilatis . . *P. tenuisecta.*

22. Curvipes.

P. curvipes *Hook. fil.; Flor. Brit. Ind.* iv, 316.

Glabra ramosa ramis procumbentibus arcuatis foliis parvis petiolatis ovatis pinnatisectis segmentis dentatis calycis ovati 2-dentati dentibus flabellato-rotundatis inciso-serratis capsula ovata parum exserta.

Pedicellis reflexis . . . . . *P. curvipes.*

23. Carnosæ.

P. carnosa *Wall.*; *Cat.* 418.
P. crenata *Maxim.*; *Mel. Biol.* xii, 832.
P. corymbosa *Prain*; *Jour. As. Soc. Beng.* lviii, 2, 277.
P. zeylanica *Benth.*; *Scroph. Ind.* 54.

Elatiores ramosæ caulibus gracilibus flexuosis foliis carnosis vel herbaceis subsessilibus vel breve petiolatis oblongo-lanceolatis vel ovatis basi attenuatis margine semel crenatis lobatis bracteis foliaceis calycis herbacei ovati 2-fidi antice semifissi segmentis serratis corollæ tubo sursum parum ampliato, filamentis ex adverso summi ovarii insertis, capsula ovata parum exserta.

Galea rostrata, labio margine ciliato :—
tubo calyce vix ½ longiore galea abruptius incurva rostro elongato tenuiore porrecto apice emarginato filamentis omnibus glabris . . *P. carnosa.*
tubo calyce plus ½ longiore galea leviter falcata rostro breve conico apice integro filamentis anticis superne barbatis . . . *P. crenata.*

Galea erostri, labio margine eciliato :—
tubo calyce 2-plo longiore galea late arcuato-incurva labium excedente apice integra filamentis omnino glaberrimis . . . . *P. corymbosa.*
tubo calyce vix ½ longiore galea fere erecta labio manifeste breviore apice crenata filamentis basi villosulis superne glabris . . . . *P. zeylanica.*

24. Racemosæ.

P. racemosa *Doug.*; *Hook.*, *Flor. Bor. Amer.* ii, 108.
P. yezöensis *Maxim.*; *Mel. Biol.* x, 106.
P. resupinata *Linn.*; *Sp. Plant.* 608.
P. Collettii *Prain*; *Jour. As. Soc. Beng.* lviii, 2, 278.
P. lanceolata *Michx*; *Flor. Amer. Bor.* ii, 18.

Elatæ ramosæ glabræ pilosæ vel subscabridæ foliis herbaceis vel rigidis sæpissime sessilibus ovatis vel lanceolatis margine crenatis calycis ovati herbacei antice semifissi 2-fidi segmentis (1 specie excepta) integris, filamentis ex adverso summi ovarii insertis, capsula ovata parum exserta; foliis in 2 speciebus nonnunquam oppositis.

Calycis segmentis integris :—
galea sensim rostrata rostro incurvo labio eciliato filamentis anticis hirsutis; foliis ovatis glabris . . . . . *P. racemosa.*
galea subito rostrata rostro porrecto labio eciliato filamentis anticis hirsutis; foliis ovatis puberulis . . . . . *P. yezöensis.*
galea sensim rostrata rostro deflexo labio margine ciliato filamentis anticis hirsutis; foliis ovato-lanceolatis glabris vel subtus puberulis nonnunquam oppositis . . . . . *P. resupinata.*
galea brevissime rostrata rostro conico crasso apice emarginato tubo antice intus ciliato labio eciliato galea breviore filamentis basi villosulis ceterum glabris; foliis ovatis sessilibus subtus hispido puberulis supra rigide scaberrimis . . . . . *P. Collettii.*

Calycis segmentis serratis :—
galea breve rostrata rostro conico crasso apice integro tubo antice intus ciliato labio eciliato galeam æquante filamentis basi villosulis ceterum glabris; foliis lanceolatis distincte petiolatis sæpius oppositis glabris . . . . . *P. lanceolata.*

B.—*Rostratæ:*—Corollæ tubus rectus cylindricus sursum plus minus ampliatus calycem paulo usque 3-plo excedens labium subsessile rostrum crassiusculum apice truncatum emarginato-crenulatum (in 1 specie nullum), filamenta medio tubo vel ex adverso summi ovarii inserta; calyx nec fissus profundius 5-dentatus: folia alterna; flores condense racemosi.

25. Recutitæ.

P. incarnata *Jacq.; Flor. Austr.* ii, 24.
P. atrorubens *Schleich.; Cat. Pl. Helv.* 21.
P. recutita *Linn.; Sp. Plant.* 608.

Elatæ erectæ foliosæ glabratæ vel superne tantum pubescentes foliis petiolatis caulinis radicalibusque æquilongis pinnatifidis laciniis lanceolatis inciso-serratis calycis dentibus lineari-lanceolatis subintegris; corollæ tubo calycem æquante vel paulo superante; filamentis ex adverso summi ovarii insertis.

Galea incurva rostro porrecto parum emarginato, filamentis omnibus parce puberulis . . . . . *P. incarnata.*
Galea erecta superne curvata rostro conico apice emarginato segmentis utrinque 3-dentatis, filamentis anticis hirsutis . . . . *P. atrorubens.*
Galea erecta erostri, filamentis anticis parce hirsutis . . . . . *P. recutita.*

26. Elongatæ.

P. gyroflexa *Vill.; Hist. Pl. Dauphin.* ii, 426.
P. Barrelieri *Reichb.; Flor. Excurs.* 362.
P. tuberosa *Linn.; Sp. Plant.* 610.
P. elongata *Kerner; Nov. Pl. Spec*, Dec. i, 14.

Elatæ erectæ foliosæ glabratæ vel pubescentes foliis radicalibus cæspitosis elongatis petiolatis caulinis paucis parvis pinnatisectis segmentis pinnatifidis, calycis dentibus lanceolatis, corollæ tubo calycem æquante vel paulo superante, filamentis ex adverso summi ovarii insertis.

Calyce dentibus omnibus integris; labio lobo medio lateralibus minore:—
filamentis omnibus hirsutis . . . . . *P. gyroflexa.*
filamentis anticis hirsutis . . . . . *P. Barrelieri.*
Calyce dentibus (summo deltoideo excepto) margine serratis; filamentis anticis tantum hirsutis:—
labio lobo medio lateralibus minore . . . . . *P. tuberosa.*
labio lobis subæquilatis . . . . . *P. elongata.*

27. Cæspitosæ.

P. rostrata *Linn.; Sp. Plant.* 607.
P. cæspitosa *Sieber; Plant. Rar. Alp.*, fasc. iv.
P. pyrenaica *Gay; Ann. Sc. Nat.*, ser. i, v, 26, p. 210.
P. mixta *Gren. et Godr.; Philipp., Fl. Pyr.* ii, 123.
P. Nordmanniana *Bunge; Ledeb., Fl. Ross.* iii, 277.
P. cenisia *Gaud.; Flor. Helvet.* iv, 132.
P. elegans *Ten.; Syll. Pl. App.* iv, 30.
P. odontophora *Prain; Jour. As. Soc. Beng.* lviii, 2, 275.

Humiles arcuato-ascendentes vel raro erectæ glabratæ vel pubescentes foliis radicalibus cæspitosis elongatis petiolatis pinnatisectis segmentis pinnatifidis calycis dentibus lanceolatis corollæ tubo calycem parum superante filamentis ex adverso summi ovarii (in 1 specie medio tubo) insertis.

Calyce dentibus omnibus serratis, filamentis anticis hirsutis :—
corollæ tubo intus glaberrimo; calyce glabro :—
labio margine ciliato . . . . . *P. rostrata.*
labio margine eciliato . . . . . *P. cæspitosa.*
corollæ tubo intus versus basin ciliato, labio eciliato :—
calyce glaberrimo . . . . . *P. pyrenaica.*
calyce villoso . . . . . *P. mixta.*
Calyce dente summo integro reliquis serratis, labio eciliato, corollæ tubo intus glabro :—
filamentis anticis tantum hirsutis :—
calyce glaberrimo . . . . . *P. Nordmanniana.*
calyce villoso . . . . . *P. cenisia.*
filamentis omnibus hirsutis; calyce hirsuto . . . . . *P. elegans.*
Calyce dentibus omnibus integris, labio eciliato, filamentis medio tubo insertis anticis hirsutis . . . . . *P. odontophora.*

28. Asplenifoliæ.

Humiles glabratæ vel pubescentes foliis radicalibus cæspitosis elongatis lanceolatis petiolatis segmentis ovatis oblongisve dentatis, foliis caulinis subnullis, corollæ tubo calycem sæpissime plus minus excedente filamentis medio tubo insertis.

Calyce dentibus omnibus serratis :—
labio margine ciliato :—
labio parvulo; filamentis glabris . . . . . *P. pedicellata.*
labio majore; filamentis anticis barbatis . . . . . *P. Filicula.*
labio margine eciliato :—
rostro breve crasso apice truncato 2-fido, filamentis anticis hirsutis *P. geminata.*
rostro porrecto apice emarginato filamentis anticis parcissime puberulis . . . . . *P. asplenifolia.*
Calyce dente summo integro, reliquis serratis; filamentis omnibus glabris . *P. Potanini.*
Calyce dentibus omnibus integris :—
rostro porrecto filamentis glabris . . . . . *P. albiflora.*
rostro deflexo-curvato (filamentis nondum descriptis) . . . . . *P. ornithorrhyncha.*

P. pedicellata *Bunge; Bull. Sc. Acad. St. Petersb.* vii, n. 16.
P. Filicula *Franchet; Maxim., Mel. Biol.* xii, 853.
P. geminata *Portenschlag; Gebh. Verzeichn.* 190.
P. asplenifolia *Floerke; Willd., Sp. Plant.* iii, 208.
P. Potanini *Maxim.; Mel. Biol.* xii, 848.
P. albiflora *Prain; Jour. As. Soc. Beng.* lviii, 2, 273.
P. ornithorrhyncha *Benth.; DC., Prodr.* x, 577.

29. Paucifoliatæ.

P. yunnanensis *Franchet; Maxim., Mel. Biol.* xii, 851.
P. tsangchanensis *Franchet ; Maxim., Mel. Biol.* xii, 850.
P. Wallichii *Bunge; Bull. Sc. Acad. Petersb.* viii, 251.

Humiles foliosæ glabratæ vel pubescentes foliis longe petiolatis radicalibus paucis caulinis radicalia fere æquantibus lanceolato-oblongis segmentis obtusis serratis calyce dentibus summo minimo excepto basi integris apice serratis filamentis medio tubo vel paulo supra medium insertis.

Labio margine ciliato; rostro filiformi deflexo filamentis anticis hirsutis . . . . . *P. yunnanensis.*

Labio margine eciliato :—

rostro gracili porrecto filamentis anticis hirsutis . . . . . *P. tsangchanensis.*
rostro crassiusculo horizontali truncato apice crenulato filamentis omnibus hirsutis . . . . . *P. Wallichii.*

C.—*Eurhyncholophæ :*—Corollæ tubus incurvus cylindricus sursum ampliatus calycem æquans vel parum excedens labium sæpissime stipitatum cristis inconspicuis rostrum crassiusculum apice truncatum nonnunquam nullum, filamenta infra medium tubum inserta; folia alterna; flores spicatim aggregati.

30. Surrectæ.

P. incurva *Benth.; DC., Prodr.* x, 566.
P. groenlandica *Retz.; Fl. Scand.*, ed. ii, 45.
P. attollens *A. Gray; Proc. Amer. Acad.* vii, 384.

Elatiores strictæ simplices glabratæ foliis plerisque radicalibus caulinis sparsis parvis pectinato-pinnatipartitis spica elongata densa micrantha labio subsessili rostro tenui elongato in alabastro vix omnino obtecto; calyce vix fisso 5-dentato segmentis triangularibus.

Corollæ tubo calyce subduplo longiore infracto rostro porrecto subcylindrico apice emarginato 2-lobo filamentis omnibus glabris . *P. incurva.*
Corollæ tubo calycem subæquante subrecto rostro curvato tubo duplo longiore deorsum falcato apice incurvo integro filamentis glabris . *P. groenlandica.*
Corollæ tubo calycem subæquante subrecto rostro curvato tubo breviore a basi sursum refracto apice integro filamentis omnibus hirsutis . . . . . *P. attollens.*

30*b*. Subsurrecta.

P. Viali *Franchet; Hemsl., Jour. Linn. Soc.* xxvi, 219.

Elata stricta simplex parce pubescens foliis ovato-lanceolatis pinnatisectis racemis laxis micranthis bracteis minimis sessilibus labio sessili lobis lateralibus medio angustioribus rostro tenui elongato in alabastro vix omnino obtecto, calyce vix fisso 5-dentato segmentis triangularibus.

Galea superne inflato-convexa rostro ascendente . . . . . *P. Viali.*

31. Excelsa.

P. excelsa *Hook. fil.; Flor. Brit. Ind.* iv, 311.

Altissima stricta ramosa glabrata foliis radicalibus caulinisque imis evanidis reliquis maximis 3-pinnatipartitis spica elongata bracteis minimis petiolulatis micrantha labio elongatim latissime stipitato ecristato lobis minimis lateralibus medio angustioribus rostro tenui in alabastro obtecto, calyce 5-dentato antice profunde fisso, segmentis minutis.

Galea sessili rostro apice integro filamentis glabris . . . . . *P. excelsa.*

31*b*. Vagans.

P. vagans *Hemsl.; Jour. Linn. Soc.* xxvi, 218.

Longissima gracillima debilis vagans vel scandens foliis radicalibus maximis 3-pinnatis caulinis subopppositis petiolatis oblongo-ovalibus inæqualiter 5—7-lobatis floribus axillaribus dense fasciculatis labio patente lobis subæquilatis rostro incurvo calyce 5-dentato segmentis brevibus.

Filamentis omnibus glabris . . . . . *P. vagans.*

32. Lachnoglossæ.

P. lachnoglossa *Hook. fil.; Flor. Brit. Ind.* iv, 311.
P. Orizabæ *Cham. et Schlecht.; Linnæa* v, 103.
P. mexicana *Zuccar.; Bunge, Bull. Phys. Math. Petrop.* i, n. 24, 21.
P. Parryi *A. Gray; Amer. Jour. Sci.*, ser. 2, xxxiv, 250.
P. contorta *Benth.; Hook., Flor. Bor. Amer.* ii, 103.

Elatiores strictæ simplices glabratæ foliis plerisque radicalibus caulinis sparsis diminutis pectinato-pinnatis spica elongata laxiuscula labio stipitato rostro tenui elongato calyce ovato 5-dentato ad medium fisso (in *P. contorta* nondum descripto) segmento summo minore filamentis fere medio tubo insertis.

Calyce dentibus omnibus serratis; rostro tenui pendulo apice integro penicillato-villoso labio lobis acutis margine ciliatis, filamentis glabris . . . . . *P. lachnoglossa.*

Calyce dente summo integro reliquis serratis:—

rostro conico breve crasso truncato æque longo ac lato, labio galea breviore, filamentis glabris . . . . . *P. Orizabæ.*

rostro cylindrico breve crasso crenulato latiore quam longo, labio galea longiore, filamentis anticis barbatis . . . . . *P. mexicana.*

Calyce dentibus omnibus integris:—

rostro conico latitudine galeæ longiore labium superante apice integro, filamentis anticis hirsutis . . . . . *P. Parryi.*

rostro elongato lineari in labium latissimum incurvo fere circinnato (filamentis nondum descriptis) . . . . . *P. contorta.*

33. Proboscideæ.

P. proboscidea *Stev.; Monogr. Pedic.* 33.
P. recurva *Maxim.; Mel. Biol.* xii, 838.
P. brachystachys *Bunge; Ledeb., Flor. Altaic.* ii, 429.
P. uncinata *Steph.; Willd., Sp. Plant.* iii, 213.

P. compacta *Steph.*; *Willd.*, *Sp. Plant.* iii, 219.
P. lapponica *Linn.*; *Sp. Plant.* 609.
P. Howellii *A. Gray*; *Proc. Amer. Acad.* xx, 307.

Elatæ strictæ simplices foliosæ puberulæ foliis radicalibus evanidis caulinis sursum decrescentibus sæpissime pinnatisectis segmentis ovato-lanceolatis inciso-serratis (foliis in specie l. tantum pinnatifidis in specie altera indivisis) spica elongata multiflora calyce late ovato 5-dentato segmentis deltoideis integris supparibus corollæ tubo calyce parum longiore labio distincte stipitato vix tamen basi cristato staminibus ex adverso summi ovarii insertis.

Galea margine villosa; calyce antice fisso; foliis pinnatisectis :—
labio margine ciliato :—
calyce dentibus acutis galea dorso ventreque convexa rostro horizontale late conico latitudine galea breviore, filamentis anticis hirsutis . . . . . *P. proboscidea.*
calyce dentibus obtusis galea dorso adunca rostro recurvo conico galea parum breviore, filamentis glabris . . . . . *P. recurva.*
labio margine eciliato; calyce dentibus acutis galea falcata rostro tenui apice 2-fido galeæ latitudinem subæquante, filamentis anticis hirsutis . . . . . *P. brachystachys.*
Galea margine glabra;—
calyce antice fisso;—
foliis pinnatisectis;—
labio margine ciliato; calyce dentibus acutis galea arcuata rostro apice tenui integro, filamentis anticis hirsutis . *P. uncinata.*
labio margine eciliato; calyce dentibus obtusis galea falcata rostro apice lato emarginato, filamentis anticis vix hirsutis . . . . . *P. compacta.*
foliis pinnatifidis; labio margine glabro; calyce dentibus minutis galea arcuata rostro breve crasso fere cylindrico, filamentis glabris . . . . . *P. lapponica.*
calyce haud fisso; foliis indivisis; labio margine glabro; calycis dentibus acutis galea angulatim incurva rostro breve conico obtuso, filamentis glabris . . . . . *P. Howellii.*

34. Tristes.

P. craspedotricha *Maxim.*; *Mel. Biol.* xii, 839.
P. lasiophrys *Maxim.*; *Mel. Biol.* x, 104.
P. trichoglossa *Hook. fil.*; *Flor. Brit. Ind.* iv, 310.
P. rhodotricha *Maxim.*; *Mel. Biol.* xii, 843.
P. tristis *Linn.*; *Sp. Plant.* 608.

Elatæ strictæ simplices foliosæ pubescentes foliis radicalibus evanidis caulinis sparsis (vel in *P. lasiophride* congestis) sessilibus lineari-oblongis obtusis obtuse crenatis vel pinnatis crenis dentatis vel lobis serratis spica densa vel basi interrupta calyce ovato-oblongo membranaceo 5-fido segmentis deltoideis ovatisve supparibus corollæ tubo calycem parum excedente labio coriaceo lobis æquilatis brevissime stipitato ecristato et galea breviore filamentis ex adverso summi ovarii insertis omnibus glabris; rhizomate subterraneo incrassato fiagella in caules annuos producta emittente.

Calyce dentibus integris:—

galea falcata dorso glabra margine inferiore tantum villosa rostro crassiusculo conico apice 2-dentato, labio 3-fido rotundato margine eciliato . . . . . *P. craspedotricha.*

galea arcuata dorso glabra fronte dense lanata rostro tenui gracile deflexo apice integro, labio 3-partito obovato, margine parcissime ciliato . . . . . *P. lasiophrys.*

Calyce dentibus serratis:—

galea angulo recto incurva dorso fronteque lanata margine inferiore tamen glabra rostro tenui deflexo apice integro, labio profunde 3-fido reniforme, margine eciliato . . . . . *P. trichoglossa.*

galea falcata dorso fronte et margine inferiore omnibus lanata rostro crassiusculo conico deflexo apice 2-fido, labio 3-fido reniforme margine ciliato . . . . . *P. rhodotricha.*

galea falcata margine inferiore tantum villosa fronte clausa angulo frontali inferiore acuto apiculato, labio profunde 3-fido cordato-rotundato, margine eciliato . . . . . *P. tristis.*

35. Rudes.

P. Clarkei *Hook. fil.; Flor. Brit. Ind.* iv, 310.
P. ingens *Maxim.; Mel. Biol.* xii, 841.
P. rudis *Maxim.; Mel. Biol.* x, 102.
P. Prainiana *Maxim.; Mel. Biol.* xii, 844.

Elatæ strictæ simplices foliosæ pubescentes foliis radicalibus evanidis caulinis sparsis auriculato-sessilibus lineari-oblongis pinnatisectis segmentis ovato-oblongis acutis mucronato-dentatis spica condensata vel basi interrupta calyce campanulato membranaceo 5-dentato segmentis deltoideis serratis supparibus labio obovato longe stipitato basi minutissime cristato lobis æquimagnis filamentis medio tubo vel paulo demissius insertis; rhizomate incrassato subterraneo flagella in caules annuos producta emittente.

Galea rostrata rostro apice 2-fido, corollæ tubo extus glabro, labio galeam subsuperante lobis obovatis:—

galea arcuata margine glabra rostro conico porrecto labio cuneato-obovato 3-lobo margine ciliato, filamentis paulo medio tubo demissius insertis omnibus glabris . . . . . *P. Clarkei.*

galea angulo subobtuso incurva margine villosa rostro breve crasso labio late obdeltoideo 3-fido margine eciliato, filamentis medio tubo insertis anticis hirsutis . . . . . *P. ingens.*

Galea naviculari erostri labio margine ciliato, filamentis medio tubo insertis omnibus glabris:—

Corollæ tubo extus piloso galea margine villosa ubique æquilata labio late ovato 3-lobo galeam æquante lobis rotundatis . . . . *P. rudis.*

Corollæ tubo extus glabro galea lateribus villosa antice dilatata, labio anguste cuneato-obovato 3-fido galea manifeste breviore lobis obovatis . . . . . *P. Prainiana.*

D.—*Hyporthorrhynchæ*:—Corollæ tubus incurvus (in 2 speciebus rectus) cylindricus sursum ampliatus calycem æquans vel excedens labium sessile ecristatum rostrum crassiusculum apice truncatum filamenta sæpissime ex adverso summi ovarii inserta; folia opposita vel verticillata; flores spicatim aggregati. Calyx 5-dentatus.

36. Pseudocæspitosæ.

P. Gammieana *Prain; Jour. As. Soc. Beng.* lviii, 2, 260.
P. crassirostris *Bunge; Bull. Sc. Acad. Petersb.* viii, 248.
P. binaria *Maxim.; Mel. Biol.* xii, 861.

Humiles arcuato-ascendentes vel erectæ glabratæ vel pubescentes foliis radicalibus evanidis caulinis paucis 2-pinnatipartitis -sectisve calycis campanulati dentibus omnibus vel summo excepto serratis corollæ tubo calycem superante filamentis medio tubo insertis.

Foliis verticillatis 2-pinnatisectis; labio plano margine eciliato, rostro apice 2-fido; plantæ perennes :—
  calyce dentibus summo lanceolato integro excepto ovatis profunde inciso-dentatis, corollæ tubo recto calyce plus 2-plo longiore, filamentis anticis hirsutis . . . . . *P. Gammieana.*
  calyce dentibus omnibus lanceolatis serratis, corollæ tubo incurvo calycem parum excedente, filamentis glabris . . . . . *P. crassirostris.*
Foliis oppositis 2-pinnatipartitis; labio lobis depresso-rotundatis margine ciliato, rostro apice integro: calyce dentibus summo nano excepto oblongis serratis, corollæ tubo recto calyce plus duplo longiore, filamentis anticis hirsutis; planta annua . . . . . *P. binaria.*

37. Pseudasplenifolia.

P. schizorrhyncha *Prain; Jour. As. Soc. Beng.* lviii, 2, 260.

Humilis glabrata foliis radicalibus cæspitosis elongatis lanceolatis petiolatis segmentis ovatis dentatis foliis caulinis 1-paribus oppositis vel 0, corollæ tubo calycem excedente filamentis medio tubo insertis.

Calyce dente summo integro, reliquis serratis; filamentis anticis hirsutis, rostro apice emarginato segmentis utrinque 3-sectis . . *P. schizorrhyncha.*

38. Myriophyllæ.

P. Tartinowi *Maxim.; Mel. Biol.* x, 92.
P. curvituba *Maxim.; Mel. Biol.* x, 92.
P. myriophylla *Pallas; Itin.* iii, *App.*, 737.
P. Chamissonis *Stev.; Monogr. Pedic.*, 20.
P. alaschanica *Maxim.; Mel. Biol.* x, 91.

Elatæ erectæ ramosæ vel pluricaules caulibus arcuato-ascendentibus simplicibus vel parce ramosis, foliis 4-natim verticillatis pinnatisectis segmentis distantibus linearilanceolatis pinnatipartitis verticillis florum numerosis interruptis, bracteis saltem summis ovatis integris vel apice tantum serratis calyce ovoideo-inflato parum fisso dentibus triangularibus æqualibus, filamentis ex adverso summi ovarii insertis capsula parum exserta.

Calycis dentibus omnibus serratis; filamentis omnibus hirsutis :—
  rostro verticali . . . . . *P. Tartinowi.*
  rostro porrecto gracile subincurvo . . . . . *P. curvituba.*
  rostro conico brevissimo . . . . . *P. myriophylla.*
Calycis dentibus omnibus integris vel subintegris; filamentis anticis tantum hirsutis :—
  rostro gracile subincurvo . . . . . *P. Chamissonis.*
  rostro breve anguste conico . . . . . *P. alaschanica.*

38*b*. Conifera.

P. conifera *Maxim.; Hemsl., Jour. Linn. Soc.* xxvi, 206.

Stricta a medio conice brevi ramosa, foliis parvis 4—5-natim verticillatis pinnatisectis segmentis approximatis oblongis pinnatifidis, floribus apice caulis ramorumque denso racemosis bracteis foliiformibus calyce turbinato dentibus ex integra basi rotundatis dentatis labio galea breviore filamentis triente superiore tubi insertis.

Rostro elongato rectiusculo apice obtuso emarginato labio lobo medio anguste ovato apice cucullato filamentis omnibus glabris . *P. conifera.*

39. Longicaulis.

P. longicaulis *Franchet; Maxim., Mel. Biol.* xii, 858.

Elata diffuse ramosissima foliis caulinis 4-natim ramealibus per 2 et 3 verticillatis subsessilibus ellipticis pinnatipartitis laciniis cartilagineo-serratis, floribus axillaribus calyce membranaceo campanulato profunde dentato dentibus æqualibus basi integris lamina ovatis inciso dentatis, filamentis ex adverso summi ovarii insertis.

Corollæ tubo calycem fere duplo superante, galea falcata fronte declivi, rostro porrecto cylindrico, labio lobo medio prominenter acuminato, filamentis omnibus glabris . . . . . *P. longicaulis.*

§§§§ Bidentatæ.

Corollæ tubus calycem paulo excedens galea adunca erostris vel brevissime latirostris infra apicem utrinque 1- rarissime pluridentata, labium stipitatum basi erectum supra 2-cristatum. Filamenta sæpissime ex adverso summi ovarii inserta. Folia pleraque alterna. Flores spicati et semper ordine centripeto aperti. *Bidentatæ* Maxim. Mel Biol. x, 111 (1877).

Species potius ditionum subarcticarum quam regionum arctico-alpinarum incolæ; præsertim tamen in provinciis subborealibus (*e.g.* Siberia) occurrunt; in provinciis sub-æquinoctialibus (*e.g.* Caucasica et Yunnanensi-Himalaica) per-raræ sunt.

A.—*Oppositifoliæ :*—Labium corollæ majusculum rarissime parvulum patens. Folia opposita vel verticillata. Calyx 5-dentatus; in 1. 2-lobatus, lobis altero 2- altero 3-dentato.

40. Lyratæ.

P. deltoidea *Franchet; Maxim., Mel. Biol.* xii, 897.
P. lutescens *Franchet; Maxim., Mel. Biol.* xii, 898.
P. lyrata *Prain; Maxim., Mel. Biol.* xii, 900.

Humiles vel nanæ foliis ovatis oblongisve pinnatilobis segmentis ovatis serrato-dentatis vel crenulatis calycis campanulati dentibus lanceolatis, galea labium parvulum superante apice rotundata saccato-producta tubo recto calyce longiore filamentis omnibus glabris.

Spithamea foliis deltoideo-ovatis corollæ tubo calyce sesquilongiore galea utrinque 1-dentata . . . . . *P. deltoidea.*
Spithamea foliis oblongis corollæ tubo calyce parum longiore galea utrinque 5-dentata . . . . . *P. lutescens.*
Pygmæa subacaulis, foliis cordato-ovatis longiuscule petiolatis corollæ tubo calyce 2-plo longiore galea utrinque 3-dentata . . . . . *P. lyrata.*

41. Melampyrifolia.

P. melampyrifolia *Franchet ; Maxim., Mel. Biol.* xii, 896.

Stricta superne fastigiato-ramosa foliis 4-natim verticillatis lanceolatis pinnatisectis segmentis pinnatifidis calycis cylindrici dentibus ellipticis mucronato-dentatis galea labium majusculum subæquante apice rotundata saccato-producta, tubo incurvo calyce longiore filamentis omnibus glabris.

Corollæ tubo calyce 2-plo longiore, galea utrinque 1-dentata . . *P. melampyrifolia.*

42. Rigidæ.

P. comptoniæfolia *Franchet ; Maxim., Mel. Biol.* xii, 871.
P. rigida *Franchet ; Maxim., Mel. Biol.* xii, 872.

Strictæ superne breviter ramosæ foliis 4-natim verticillatis oblongo-lanceolatis pinnatilobis segmentis denticulatis calycis campanulati dentibus minutis brevissimis galea fronte verticali in rostrum latum breve continuata.

Corollæ tubo calyce fere 3-plo longiore, galeæ dentibus brevibus filamentis anticis parce hirsutis . . . . . *P. comptoniæfolia.*
Corollæ tubo calyce 2-plo longiore, galeæ dentibus subulatis filamentis omnibus glabris . . . . . *P. rigida.*

43. Platyrrhynchæ.

P. subrostrata *C. A. Mey. ; Ind. Cauc.* 108.
P. platyrrhyncha *Schrenk ; Bull. Phys. Math. Petersb.* i, 79.
P. interrupta *Steph. ; Willd., Sp. Plant.* iii, 214.
P. chorgossica *Regel et Winkl. ; Act. Hort. Petrop.* vi, 350.

Nanæ vel elatæ simplices foliis 4-natim verticillatis lanceolatis pinnatipartitis -sectisve laciniis ovatis lanceolatisve calycis cylindrico-campanulati nec fissi dentibus subulatis lanceolatisve galea fronte verticali in rostrum latum breve continuata, bracteis liberis, filamentis anticis tantum hirsutis.

Galea labium æquante brevissime rostrata rostro dente lato perbrevi . *P. subrostrata.*
Galea labium superante distincte late rostrata :—
rostro dente lato distinctissimo . . . . . *P. platyrrhyncha.*
rostro truncato dente mere anguliformi . . . . . *P. interrupta.*
rostro conspicuo angulo apicali antico obtuso postico in dentem acuminatum protracto . . . . . *P. chorgossica.*

44. Superbæ.

P. superba *Franchet ; Maxim., Mel. Biol.* xii, 874.
P. rex *Clarke ; Maxim., Mel. Biol.* xii, 875.

Elatæ simplices vel superne fastigiatim ramosæ foliis 4-natim verticillatis 2-pinnatisectis calycis ovati hinc fissi galea fronte verticali rostrata vel erostri ; petiolis bracteisque basibus dilatatis in vaginam ochreatam perfoliatam connatis, filamentis omnibus superne barbatis.

Calyce e vagina bractearum exserto 5-dentato dentibus cristatis, corolla rubra labio amplo galeam rostratam edentulam superante : caule tereto . . . . . *P. superba.*

Calyce vagina incluso 2-lobo, dentibus nanis integris, corolla flava labio parvo quam galea infra apicem truncatum 2-dentata 2-plo breviore: caule tetragono . . . . . *P. rex.*

B.— *Veræ :*—Labium corollæ majusculum patens. Folia sparsa. Calyx 5-dentatus.

45. Sudeticæ.

P. nasuta *M. Bieb.; Stev., Monogr. Pedic.* 43.
P. sudetica *Willd.; Sp. Plant.* iii, 209.
P. scopulorum *A. Gray; Syn. Fl. N. Amer.*, 2 ed., ii, i, 308.
P. songarica *Schrenk; Bull. Phys. Math. Acad. Petersb.* i, 79.
P. sarawschanica *Regel; Pl. Fedtschenk.*, 61.
P. villosa *Ledeb.; Spreng., Syst. Veg.* ii, 780.

Humiles simplices caulibus subaphyllis vel parvifoliis basi squamis aphyllis vestitis, foliis pinnatipartitis laciniis serratis calycis dentibus æqualibus.

Galea rostro breve conico apice crenulato dente mere anguliformi; spica capitata multiflora densa; calycis dentibus integris galea labium superante; filamentis omnibus glabris . . . . . *P. nasuta.*

Galea rostro brevissimo vel nullo :—
spica capitata multiflora densa :—
rostro dentibusque brevibus; filamentis glabris :—
calyce dentibus lanceolatis serratis, galea labium æquante . . . . . *P. sudetica.*
calyce dentibus deltoideis integris, galea labium superante . . . . . *P. scopulorum.*
rostro nullo dentibus longiusculis; galea labium superante :—
calyce dentibus lanceolatis acuminatis, filamentis anticis hirsutis . . . . . *P. songarica.*
calyce dentibus deltoideis; filamentis omnibus glabris; planta nana subacaulis . . . . . *P. sarawschanica.*
spica elongata basi interrupta, rostro nullo dentibus brevibus, calycis dentibus integris galea labium æquante, filamentis omnibus glabris . . . . . *P. villosa.*

46. Elata.

P. elata *Willd.; Sp. Plant.* iii, 210.

Elata simplex caule crebre foliato basi squamis aphyllis vestito foliis pinnatipartitis laciniis serratis calycis dentibus æqualibus integris spica elongata.

Galea subrostrata dentibus brevibus labium duplo superante filamentis anticis hirsutis . . . . . *P. elata.*

47. Comosæ.

P. schizocalyx *Lange; Prodr. Flor. Hispan.* ii, 609.
P. fissa *Turcz.; Bunge, Bull. Phys. Math. Ac. Petersb.* i, sub 24.
P. asparagoides *Lapeyr.; Abr.* 349.
P. heterodonta *Panč.; Add. ad fl. princ. Serbiæ* 196.
P. altaica *Steph.; Stev., Monogr. Pedic.* 48.
P. venusta *Schang.; Bunge, Bull. Phys. Math. Ac. Petersb.* i, 24.
P. brachyodonta *Schloss. et Vukot.; Flora Croatica* 682.

P. comosa *Linn.; Sp. Plant.* 609.
P. campestris *Griseb. et Schrenk; Iter. Hungar.* 324.
P. apodochila *Maxim.; Mel. Biol.* xii, 907.
P. læta *Stev.; Bunge, Ledeb., Flor. Ross.* iii, 289.
P. petiolaris *Ten.; Syll. App.* iv, 30.
P. uliginosa *Bunge; Ind. Sem. Hort. Dorpat.* (1839), p. viii.
P. rubens *Steph.; Willd., Sp. Plant.* iii, 219.
P. flava *Pall.; Itin.* iii, *App.* 736.
P. mandshurica *Maxim.; Mel. Biol.* x, 120.
P. occulta *Janka; Oesterr. Bot. Zeitschr.* (1872), 180.
P. physocalyx *Bunge; Bull. Phys. Math. Ac. Petersb.* i, 382.
P. leucodon *Griseb.; Spicil. Pl. Rumel.* ii, 17.
P. lasiostachys *Bunge; Ledeb., Flor. Altaic.* ii, 434.
P. græca *Bunge; Bull. Phys. Math. Ac. Petersb.* i, 24, p. 10.
P. achilleæfolia *Steph.; Willd., Sp. Plant.* iii, 219.
P. Friderici Augusti *Tommas.; Linnæa* xiii, 74.

Sæpius elatæ foliatæ foliis radicalibus cæspitosis lanceolatis elongatis semel vel bis pinnatipartitis -sectisve, spica varia plerumque elongata.

Calycis dentibus deltoideis circiter æque longis ac latis :—
- calycis dentibus crenatis . . . . . *P. schizocalyx.*
- calycis dentibus integris :—
  - floribus purpureis :—
    - calyce reticulato, labio galeam æquante filamentis glabris . *P. fissa.*
    - calyce non reticulato, labio galea breviore filamentis anticis hirsutis . . . . . *P. asparagoides.*
  - floribus flavis :—
    - corollæ tubo seriatim longitudinaliter piloso, bracteis triangulis pinnatifidis . . . . . *P. heterodonta.*
    - corollæ tubo extus glabro :—
      - bracteis cuneatis 3-fidis :—
        - galea suberostris . . . . . *P. altaica.*
        - galea rostrata . . . . . *P. venusta.*
      - bracteis lineari-lanceolatis :—
        - cristis labii brevibus ovatis ad loborum sinum . . *P. brachyodonta.*
        - cristis labii elongatis parallelis :—
          - capsula oblique ovata acuminata . . . . . *P. comosa.*
          - capsula recte ovato-lanceolata . . . . . *P. campestris.*

Calycis dentibus lanceolatis vel spathulatis :—
- floribus purpureis :—
  - labio sessile galea longiore latissimo foliis in lacinias lineares iteratim dissectis . . . . . *P. apodochila.*
  - labio stipitato :—
    - bracteis linearibus :—
      - caule glabro, bracteis dentibusque calycis integris . . *P. læta.*
      - caule villoso bracteis serratis, calycis dentibus integris . *P. petiolaris.*

bracteis cuneatis palmatifidis :—
segmentis foliorum pinnatifidis dentibus calycis deltoideis subæqualibus, galea distincte rostrata . . *P. uliginosa.*
segmentis foliorum pinnatipartitis, dentibus calycis subulatis, galea brevissime rostrata . . . . . *P. rubens.*

floribus albis vel flavis :—
labio galea longiore dentibus calycis serratis :—
bracteis 3-partitis . . . . . *P. flava.*
bracteis foliaceis serratis . . . . . *P. mandshurica.*

galea labio longiore :—
bracteis cuneatis pinnatifidis . . . . . *P. occulta.*

bracteis linearibus :—
calycis dentibus et bracteis serratis :—
calycis tubo parce vel non reticulato, ovario ovato-oblongo :—
spica densa hirsuta vel lanata :—
spica flavo-lanata, capsula semi-ovata antice recta calyce multo longiore . . *P. lasiostachys.*
spica cinereo-hirsuta, capsula oblongo-ovata calyce parum longiore . . . . *P. græca.*
spica laxa subglabra . . . . . *P. leucodon.*
calycis tubo copiose reticulato, capsula late ovata calyce inclusa . . . . . *P. physocalyx.*
calycis dentibus et bracteis integerrimis :—
tota breviter canescente, capsula lanceolato-oblonga oblique acuminata calyce 2-plo longiore filamentis anticis parce barbatis . . . . . *P. achilleæfolia.*
spica villosa, capsula ovato-lanceolata cum apiculo fere recto calyce parum longiore filamentis omnibus parce barbatis . . . . . *P. Friderici Augusti.*

48. Dolichorrhiza.

P. dolichorrhiza *Schrenk; Enum. Pl. Nov.* ii, 23.

Altissima stricta foliata foliis radicalibus cæspitosis mox evanidis 2-pinnatipartitis spica elongata interrupta ; calycis dentibus triangularibus integris æquilatis tubo reticulato ; filamentis anticis hirsutis.

Bracteis 3-partitis, laciniis lateralibus dentiformibus, galea rostrata rostro longiore quam lato deorsum declivi capsula ovato-lanceolata exserta . . . . . *P. dolichorrhiza.*

C.—*Striatæ* :—Labium corollæ parvum accumbens. Folia sparsa. Calyx 5-dentatus.

48*b*. Hirtella.

P. hirtella *Franchet; Hemsl., Jour. Linn. Soc.* xxvi, 209.

Elata stricta foliata foliis pinnatifidis radicalibus breve petiolatis caulinis subsessilibus segmentis obtusis inciso-serratis racemis multifloris laxis elongatis bracteis ovato-lanceolatis calyce distincte dentato segmentis lateralibus triangularibus postico anticisque linearibus.

Corollæ tubo longe exserto labio breviter 3-lobo lobis supparibus, galea brevi fronte verticali dentibus subulatis, calycis segmentis denticulatis . . . . . *P. hirtella.*

49. Striatæ.

P. striata *Pall.; Itin.* iii, 266.
P. procera *A. Gray; Amer. Jour. Sci.*, ser. 2, xxxiv, 251.
P. Furbishiæ *S. Wats.; Proc. Amer. Acad.* xvii, 375.

Elatæ strictæ foliatæ foliis pinnatipartitis -sectisve segmentis dentatis inciso-lobatis vel pinnatifidis, racemis multifloris bracteis e basi latiore integra cuspidatis cuspide integro vel serrato, calyce profunde dentato, filamentis anticis superne barbatis.

Foliorum laciniis linearibus dentatis, calycis dentibus integris galea 2-cuspidata labio parvo foliis pectinato-pinnatipartitis . . . . *P. striata.*

Foliorum laciniis lanceolatis vel ovatis iterum lobatis vel fissis :—

foliis pinnatisectis segmentis lanceolatis pinnatifidis, corolla ampla galea 2-cuspidata labio denticulato æquilonga, calycis dentibus integris . . . . . *P. procera.*

foliis pinnatipartitis laciniis ovatis pinnatilobis calycis dentibus serratis labio galea breviore . . . . . *P. Furbishiæ.*

D.—*Racemiflorœ :*—Labium corollæ majusculum patens. Folia sparsa. Calyx 2–3-dentatus (in 2. 5-dentatus).

50. Palustres.

P. lusitanica *Link et Hffgg; Fl. Portug.* i, 306.
P. sylvatica *Linn.; Sp. Plant.* 607.
P. euphrasioides *Steph.; Willd., Sp. Plant.* iii, 204.
P. angustifolia *Benth.; Pl. Hartw.* 22.
P. adunca *M. Bieb.; Stev., Monogr. Pedic.* 29.
P. palustris *Linn.; Sp. Plant.* 607.

Humiles vel elatiores simplices multicaules vel ramosæ glabratæ foliis pinnatisectis -partitisve, ramealibus nonnunquam oppositis, calyce fisso dentibus (*P. euphrasioidis* et *P. angustifoliæ* exceptis) dentatis cristatisve.

Galea infra apicem tantum 2-dentata tubo calyce sesqui- vel duplo longiore :—

calyce 5-dentato galea apice incurva valde cucullata capsula inclusa, caulibus basi ipsa ramosis ramis longioribus foliis pinnatisectis :—

labio galea æquilongo . . . . . *P. lusitanica.*
labio galea breviore . . . . . *P. sylvatica.*

calyce 2—3-dentato dentibus brevibus integris, galea rostrata, capsula lanceolata caulibus ramosis :—

galea fronte subdeclivi, foliis pinnatipartitis superioribus serratis, capsula calyce 2-plo longiore . . . . . *P. euphrasioides.*

galea fronte verticali foliis anguste linearibus crenulatis, capsula calyce 3-plo longiore, labio parvulo galea breviore . *P. angustifolia.*

Galea simul infra apicem et infra medium 2-dentata, calyce 2-fido dentatoque :—

corollæ tubo vix exserto, galea apice declivi rostrata, floribus confertis, segmentis foliorum serratis . . . . . *P. adunca.*

corollæ tubo calyce sesquilongiore, galea apice verticali erostri, floribus sæpissime sparsis, segmentis foliorum pinnatifidis . . . *P. palustris.*

51. Canadenses.

P. canadensis *Linn.*; *Mantiss. Plant.* 86.
P. crenulata *Benth.*; *DC., Prodr.* x, 568.

Humiles vel elatiores simplices erectæ foliis pinnatilobis vel crenatis pubescentibus caulibus basi squamis aphyllis vestitis, calyce antice profunde fisso dentibus minutis vel deficientbius, corollæ tubo calyce 2-plo longiore galea infra apicem tantum 2-dentata.

Foliis inferioribus pinnatipartitis segmentis ovatis oblongisve inciso-dentatis, ceteris semipinnatifidis ; dente sub-apicali longiusculo. . . . . *P. canadensis.*
Foliis omnibus lineari-oblongis obtusis crenatis, dente sub-apicali brevi . . . . . *P. crenulata.*

III.—EROSTRES.

Corollæ tubus infractus vel rectus sursum ampliatus labium stipitatum basi erectum supra 2-cristatum galea recta erostris labioque tenera.

§§§§§ ANODONTÆ.

Corollæ tubus sæpissime infractus nonnunquam rectus rarissime mere incurvus vulgo calycem parum excedens, galea tenera sæpissime erecta erostris vel rarissime minute et inchoate rostrata infra apicem edentata (rarius utrinque inconstanter et minutissime dentata). Filamenta sæpissime ex adverso summi ovarii inserta. Folia alterna vel opposita. Flores spicati (in 3., quibus caules desunt, pauci et longissime pedicellati) sæpissime ordine centripeto aperti (flores centrifugi sub-sectionis 1. proprii). *Anodon* Bunge in Ledeb., Flor. Ross. iii, 296 (1846).

Species sparsifoliatæ quidem provinciarum omnium incolæ, præsertim tamen circumpolares vel in Europâ, Siberiâ, Americâque arctico-alpinæ, in provinciis reliquis perraræ ; verticillatæ autem præsertim Indo-Sinenses, nonnullæ Caucaso-Sibiricæ, paucæ etiam circumpolares una tantum Europæa, ne singula quidem vera Americana.

A.—*Sceptra* :— Corollæ tubus rectus exsertus galea sæpissime curvata apice cucullata angulo mox superiore mox inferiore magis prominente, posteriore tunc acutiusculo, labium galeæ parallelum (in 1 specie accumbens), plerumque illa brevius. Calyx 5-dentatus vel 5-fidus. Folia majuscula alterna. Species fere omnes macranthæ et (3. acaulibus exceptis) robustæ.

52. Acaules.

P. Regeliana *Prain*; *Jour. As. Soc. Beng.* lviii, 2, 274.
P. Artselæri *Maxim.*; *Mel. Biol.* x, 127.
P. acaulis *Wulf.*; *Jacq., Collectan.* i, 207.

Nanæ acaules foliis cæspitosis petiolatis pinnatisectis segmentis ovatis serrato-dentatis floribus omnibus axillaribus longe pedunculatis labio galeam æquante calyce 5-fido laciniis lanceolatis serratis, capsula obliqua.

Calyce antice triente fisso, capsula lanceolata calyce 2-plo longiore, galea breve rostrata cristata, pedicellis floribus longioribus segmentis foliorum distantibus, antheribus mucronulatis ; corolla purpurea . . . . . *P. Regeliana.*

Calyce antice vix fisso, capsula ovata calycis tubo arcte inclusa, galea erostri ecristata :—

pedicellis florem æquantibus segmentis foliorum distantibus, galea acuta, antheribus mucronulatis; corolla violacea . . *P. Artselæri.*

pedicellis calyce brevioribus segmentis foliorum densis, galea obtusa, antheribus muticis ; corolla alba . . . . . *P. acaulis.*

53. Capitatæ.

P. capitata *Ad. ; Mem. Soc. Mosc.* v, 100.
P. Maximowiczii *Krasn. ; Script. Bot. Hort. Univ. Petrop.* ii, 18.
P. semibarbata *A. Gray ; Proc. Amer. Acad.* vii, 385.
P. centranthera *A. Gray ; Bot. Mex. Bound.* 120.

Humiles caulibus brevissimis foliatis, foliis petiolatis pinnatipartitis -sectisve, radicalibus cæspitosis vel 0, segmentis ovatis serratis dentatisve floribus in spicam basi passim compositam foliatam digestis labio galea distincte minore calyce 5-dentato laciniis dentatis.

Caule præter folia floralia nudo vel sub-nudo nano folia radicalia pinnatisecta vix superante spica pauciflora densa floribus albis :—

caule subsolitario, galea a medio incurva angulo apicali inferiore acuto labium parallelum angustum 2-plo superante filamentis omnibus glabris . . . . . *P. capitata.*

caulibus numerosis cæspitosis galea tantum apice incurva angulo inferiore truncato labio amplo rotundato patente subbreviore filamentis anticis hirsutis . . . . . *P. Maximowiczii.*

Foliis pinnatipartitis radicalibus nullis caulinis spicam multifloram superantibus, galea subrecta apice tota convexa labium parum superante :—

laciniis foliorum pinnatifidis, spica sæpe basi composita, corolla ochroleuca minore antheris breve mucronatis . . . . . *P. semibarbata.*

laciniis duplicato-dentatis, spica simplice corolla purpurea majuscula, antheris longe aristatis . . . . . *P. centranthera.*

54. Gloriosæ.

P. Sceptrum Carolinum *Linn. ; Sp. Plant.* 608.
P. gloriosa *Biss. et Moore ; Jour. Bot.* xv (1877), 295.

Elatæ scapo nudo sæpe ramoso foliis radicalibus cæspitosis petiolatis pinnatipartitis -sectisve segmentis ovatis spica elongata aphylla bracteis basi dilatatis, floribus magnis labio galea recta æquilongo.

Partitionibus foliorum obtuse lobatis, scapo vulgo simplice, floribus flavis galea labio parallela . . . . . *P. Sceptrum Carolinum.*

Segmentis foliorum pinnatifidis, scapo ramoso floribus roseis, labio patente . . . . . *P. gloriosa.*

55. Grandiflora.

P. grandiflora *Fisch.; Mem. Soc. Mosc.* iii, 60.

Elata ramosa caule foliato foliis sub ter pinnatisectis spica exserta floribus maximis labio galea incurva subæquilongo parallelo.

Galea acuta margine villosa, antheribus longe aristatis; corolla purpurea . . . . . *P. grandiflora.*

B.—*Cyclophylla* :—Corollæ tubus infractus galea recta sæpissime erecta angulo superiore rotundato inferiore (2 sp. exceptis) acuto labium patulum galeam subæquans. Calyx 5-dentatus. Folia 3—5- (sæpissime 4-) natim verticillata rarius opposita.

56. Cheilanthifoliæ.

P. globifera *Hook. fil.; Flor. Brit. Ind.* iv, 308.
P. anas *Maxim.; Mel. Biol.* xii, 860.
P. cheilanthifolia *Schrenk; Enum. Pl. Nov.* ii, 19.
P. Menziesii *Benth.; DC., Prodr.* x, 563.

Humiles vel elatiores multicaules pubescentes vel glabratæ foliis lanceolatis radicalibus cæspitosis caulinis 4-natim verticillatis pinnatisectis segmentis lanceolatis linearibusve dentatis calyce campanulato antice $\frac{1}{3}$—$\frac{1}{2}$-fisso dentibus brevibus inæquilatis summo deltoideo integro reliquis cristatis corollæ tubo intra calycem infracto galea basi erecta apice brevissime rostrata rostro conico integro filamentis insertione villosulis ceterum glabris.

Galea distincte rostrata:—

rostro deorsum spectante latissime conico apice rotundato . . . *P. globifera.*
rostro declivi anguste conico apice truncato . . . . . *P. anas.*
rostro porrecto brevissime conico truncato . . . . . *P. cheilanthifolia.*
Galea erostri vel brevissime subrostrata . . . . . *P. Menziesii.*

57. Ophiocephalæ.

P. ophiocephala *Maxim.; Mel. Biol.* xii, 867.
P. Roylei *Maxim.; Mel. Biol.* xi, 288.

Humiles vel elatiores multicaules glabratæ foliis lanceolatis radicalibus cæspitosis caulinis 4-natim verticillatis pinnatisectis segmentis linearibus inciso-serratis calyce campanulato antice vix fisso dente summo deltoideo integro reliquis e lata basi lanceolatis dentatis corollæ tubo intra calycem infracto, filamentis insertione villosulis ceterum glabris.

Galea acuminata leviter incurva labium æquante vel subsuperante. *P. ophiocephala.*
Galea abruptius clausa erecta labio manifeste breviore . . . . *P. Roylei.*

58. Microchila.

P. microchila *Franchet; Maxim., Mel. Biol.* xii, 884.

Humilis diffusa glabriuscula foliis oblongis radicalibus multo majoribus caulinis 4-natim verticillatis pinnatilobis lobis depresse rotundatis antice acute dentatis, floribus racemosis (nec spicatis) calyce campanulato antice vix fisso dentibus magnis ovatis denticulatis corollæ tubo intra calycem infracto filamentis glabris.

Galea arcuata labium plus 2-plo superante et tubo æquilongo . . *P. microchila.*

59 Amœnæ.

P. violascens *Schrenk; Enum. Pl. Nov.* ii, 22.
P. amœna *Ad.; Stev., Monogr. Pedic.* 25.
P. kansuensis *Maxim.; Mel. Biol.* xi, 287.

Humiles vel elatiores multicaules pubescentes foliis lanceolatis radicalibus cæspitosis caulinis 4-natim verticillatis pinnatisectis segmentis lanceolatis pinnatifidis -partitisve, calyce campanulato nec fisso dentibus inæqualibus deltoideis corollæ tubo intra calycem infracto filamentis anticis hirsutis.

Collo squamato, foliorum segmentis pinnatifidis calyce dentibus integris vel majoribus denticulatis labio lobo medio truncato; spica breve densa:—

galea labium superante . . . . . *P. violascens.*
labio galea longiore . . . . . *P. amœna.*

Collo esquamato, foliorum segmentis pinnatipartitis calyce dentibus serratis, labio lobis omnibus integris; spica interrupta (verticillis omnibus distantibus), labio galea longiore . . . . . *P. kansuensis.*

60. Verticillatæ.

P. spicata *Pall.; Itin.* iii, 444, *App.* 738.
P. lineata *Franchet; Maxim., Mel. Biol.* xii, 887.
P. likiangensis *Franchet; Maxim., Mel. Biol.* xii, 887.
P. verticillata *Linn.; Sp. Plant.* 608.
P. refracta *Maxim.; Mel. Biol.* xi, 289.
P. szetschuanica *Maxim.; Mel. Biol.* xii, 892.

Humiles vel elatiores multicaules pubescentes vel glabratæ caulibus sæpissime simplicibus foliis ovatis oblongisve radicalibus cæspitosis caulinis 4-natim verticillatis pinnatilobis segmentis ovatis oblongisve serratis calyce campanulato, corollæ tubo intra calycem infracto.

Galea nana labio plus duplo breviore foliis pinnatifidis -partitisve, floribus purpureis:—

bracteis flabellatis margine anteriore dentatis ceterum integris, spica elongata densa, calyce minuto subgloboso antice nec fisso dentibus parvis integris, foliis pinnatifidis caule simplice vel fastigiato-ramoso, filamentis anticis hirsutis . . . . . *P. spicata.*

bracteis oblongis vel linearibus apice foliaceis pinnatilobis vel dentatis, calyce ovato grandidentato, caule simplice, spica brevi:—

calycis nec fissi dentibus ovatis summo excepto cristatis, foliis pinnatilobis, filamentis omnibus glabris . . . . . *P. lineata.*
calycis antice fissi dentibus subulatis integris foliis pinnatifidis -partitisve, filamentis anticis hirsutis . . . . . *P. likiangensis.*

Galea labio parum breviore, calyce antice fisso dentibus brevibus integris vel obsolete denticulatis, floribus roseis vel purpureis:—

foliis brevipetiolatis pinnatipartitis calyce costato non reticulato antheris discretis filamentis anticis hirsutis, capsulis patulis . . *P. verticillata.*

foliis longiuscule petiolatis pinnatilobis -fidisve calyce tubo costato et sursum reticulato antheris contiguis, capsulis patentissimis subrefractis :—

foliis oblongis vel lanceolatis basi cuneatis racemo interrupto, galea semper æquali filamentis anticis hirsutis . . . . . *P. refracta.*
foliis cordato-ovatis vel -oblongis pinnatilobis racemo tantum basi interrupto galea angulo apicali inferiore sæpe apiculato vel infra illum rarius 2-dentata, filamentis omnibus glabris . . . . . *P. szetschuanica.*

61. Pygmæa.

P. pygmæa *Maxim.; Mel. Biol.* xii, 885.

Nana caule brevissimo basi squamato, foliis lineari-oblongis radicalibus cæspitosis caulinorumque verticillo altero petiolatis, caulinis ceteris sessilibus 4-natim verticillatis laminis pinnatisectis segmentis imbricatis rotundatis vel ovalibus mucronato-dentatis calyce ovoideo ventre fisso dentibus omnibus integris deltoideis, corollæ tubo intra calycem infracto, filamentis omnibus glabris.

Galea tubum fere æquante angulo inferiore in apiculum rotundatum protracto . . . . . *P. pygmæa.*

62. Plicatæ.

P. plicata *Maxim.; Mel. Biol.* xii, 888.
P. rupicola *Franchet; Maxim., Mel. Biol.* xii, 890.

Humiles cæspitosæ caulibus simplicibus foliis lineari-oblongis lanceolatisve imis oppositis reliquis 4-natim verticillatis pinnatisectis segmentis pinnatifidis spica terminali densa brevi (verticillo imo passim remoto) calyce campanulato ventre fisso dentibus summo excepto serratis corollæ tubo intra calycem infracto galea subarcuata apice rotundata filamentis omnibus glabris.

Galea utroque angulo obtuso cum plica induplicata distinctissima obliqua inter gibbum et apicem galeæ extensa; corolla flavescente *P. plicata.*
Galea angulo inferiore acuto cum plica superficiali obliqua secus partem anteriorem marginis; corolla rosea . . . . . *P. rupicola.*

63. Pontica.

P. pontica *Boiss.; Flor. Orient.* iv, 485.

Nana multicaulis glabrata vel puberula foliis oblongo-lanceolatis radicalibus cæspitosis caulinis 4-natim verticillatis pinnatipartitis segmentis serratis, spica breve basi interrupta, calyce campanulato dentibus lanceolatis corollæ tubo medio infracto, filamentis glabris.

Galea recta erostri apice oblique truncata angulo inferiore acuto . *P. pontica.*

64. Pilostachyæ.

P. ternata *Maxim.; Mel. Biol.* x, 98.
P. pilostachya *Maxim.; Mel. Biol.* x, 99.

Elatæ vel humiles pilosæ foliis lanceolatis radicalibus cæspitosis caulinis sæpissime 3-natim verticillatis calyce oblongo dentibus subulatis dense villoso corollæ tubo supra limbum calycis infracto filamentis glabris fere apice tubi insertis.

Verticillis florum valde distantibus cinereis, foliis radicalibus paucis; planta elata . . . . . *P. ternata.*
Spica densa albo-tomentosa, foliis radicalibus numerosis; planta humilis . . . . . *P. pilostachya.*

65. Gibberæ.

P. gibbera *Prain; Jour. As. Soc. Beng.* lviii, 2, 262.
P. polygaloides *Hook. fil.; Flor. Brit. Ind.* iv, 317.

Nanæ glabratæ vel 2-fariam pilosæ vel humiles diffuse multicaules foliis oblongis ovatisve radicalibus evanidis caulinis oppositis petiolatis pinnatifidis -partitisve floribus pedicellatis racemis paucifloris calyce campanulato dentibus summo integro excepto apice serratis corollæ tubo ipso apice tantum infracto.

Collo squamato, foliis longiuscule petiolatis late ovatis calyce antice vix fisso galea erecta apice rotundata filamentis medio tubo insertis anticis hirsutis capsula lanceolata, seminibus paucis majusculis . . . . . *P. gibbera.*
Collo esquamato, foliis breve petiolatis oblongis calyce antice $\frac{1}{3}$-fisso galea declivi brevissime rostrata rostro subacuto 2-lobo, filamentis glabris, capsula ovata, seminibus minoribus . . . . . *P. polygaloides.*

66. Denudatæ.

P. leptorhiza *Rupr.; Sert. Tiansch.* 62.
P. moschata *Maxim.; Mel. Biol.* xi, 286.
P. abrotanifolia *M. Bieb.; Stev., Monogr. Pedic.* 22.
P. denudata *Hook. fil.; Flor. Brit. Ind.* iv, 309.
P. mollis *Wall.; Cat.* 415.
P. densispica *Franchet; Maxim., Mel. Biol.* xii, 822.

Elatæ glabratæ vel pilosæ foliis oblongis lanceolatisve radicalibus sæpissime evanidis caulinis sæpissime 4-natim verticillatis floribus spicatis spicis sæpius interruptis calyce campanulato corollæ tubo ipso apice infracto filamentis sæpissime supra medium tubum insertis.

Spicis saltem basi interruptis;—

filamentis apice tubi insertis:—

galea dorso ante rostrum conicum crassum cristata filamentis anticis parce hirsutis . . . . . *P. leptorhiza.*
galea ecristata erostri angulo inferiore acuto filamentis omnibus glabris . . . . . *P. moschata.*

filamentis quadrante superiore tubi insertis:—

galea subrostrata, filamentis omnibus glabris . . . . . *P. abrotanifolia.*
galea brevissime rostrata rostro conico acuto filamentis omnibus hirsutis . . . . . *P. denudata.*

filamentis basi tubi insertis, galea erostri utroque angulo obtuso filamentis omnibus glabris . . . . . *P. mollis.*

Spica condensata filamentis medio tubo insertis galea subrecta erecta angulo inferiore in apiculum brevissimum producto filamentis anticis hirsutis . . . . . *P. densispica.*

C.—*Subbidentatæ*:—Corollæ tubus rectus vel rarius incurvus (nunquam infractus) galea recta erecta utroque angulo obtuso vel rarius angulo inferiore acuto nonnunquam infra apicem minutissime denticulata, labium patulum (in 2. accumbens) sæpissime galea brevius. Calyx 5-dentatus. Folia sæpius alterna.

67. Sima.

P. sima *Maxim.; Mel. Biol.* xii, 284.

Elata simplex vel basi ramosa pubescens foliis oblongis petiolatis pinnatipartitis laciniis ovatis obtusis serratis imis oppositis reliquis 3-natim verticillatis floribus verticillatis verticillis distantibus 3-floris imis remotis calycis cylindrici dente summo deltoideo integro reliquis ovatis serratis, corollæ tubo recto labio lobis omnibus rotundatis medio minore, filamentis glabris.

Corollæ tubo haud exserto galea subadunca inferne brevissime obtuse rostrata . . . . . *P. sima.*

68. Collata.

P. collata *Prain; Jour. As. Soc. Beng.* lviii, 2, 266.

Nana cæspitosa glabrata foliis oblongis petiolatis pinnatisectis segmentis ovatis pinnatifidis radicalibus paucis caulinis oppositis vel 0, floribus 3 (imis 2 oppositis, summo singulo) calycis cylindrici dente summo deltoideo integro reliquis ovatis serratis, corollæ tubo recto labio lobis ovato-rotundatis supparibus, filamentis anticis hirsutis.

Corollæ tubo calyce $\frac{1}{2}$ longiore, galea erecta infra apicem minutissime denticulata, staminibus medio tubo insertis . . . . . *P. collata.*

68*b*. Salviæflora.

P. salviæflora *Franchet; Hemsl., Jour. Linn. Soc.* xxvi, 215.

Elata, ramosissima, parce pubescens caulibus gracillimis foliis suboppositis pinnatipartitis segmentis ovato-lanceolatis lobatis bracteis incisis distincte petiolatis floribus dissitis laxe racemosis calycis tubulosi dentibus supparibus linearibus obtusis apice denticulatis, corollæ tubo sensim ampliato intus pubescente labio galea æquilongo.

Galea erecta fronte declivi apice villosula . . . . . *P. salviæflora.*

69. Fragiles.

P. fragilis *Prain; Maxim., Mel. Biol.* xii, 866.
P. Kingii *Prain; Maxim., Mel. Biol.* xii, 895.

Elatæ parce pubescentes caulibus gracillimis foliis oppositis ternisve ovatis pinnatipartitis -sectisve segmentis oblongis vel ovatis pinnatifidis serratisve floribus axillaribus

calyce campanulato corollæ tubo recto calyce 2-plo longiore *labio lobo medio obovato obtuso lateralibus anguste ovatis acutis latiore* staminibus basi tubi insertis filamentis anticis hirsutis.

Foliis 3-natim verticillatis subsessilibus calyce sessili nec fisso dentibus anguste lanceolatis æquilatis galea brevissime late rostrata, corolla viridi . . . . . *P. fragilis.*
Foliis oppositis longe petiolatis calyce pedicellato antice profunde fisso dentibus deltoideis summo reliquis majore galea erostri utroque angulo obtuso, corolla alba . . . . . *P. Kingii.*

70. Caucasicæ.

P. pycnantha *Boiss.; Diag.*, ser. 1, 12, p. 45.
P. Bourgeaui *Maxim.; Mel. Biol.* xi, 291.
P. cadmea *Boiss.; Diag.*, ser. 1, 4, p. 82.
P. caucasica *M. Bieb.; Fl. Taur. Cauc.* ii, 72.

Humiles glabratæ vel pubescentes foliis 2—4-natim verticillatis lanceolatis pinnatipartitis -sectisve segmentis lanceolatis floribus interrupte spicatis calyce campanulato nec fisso dentibus supparibus subintegris corollæ tubo medio incurvo labio lobis rotundatis.

Labio galea breviore, capsula calycem vix excedente:—
bracteis oblongis subintegris, ovario globoso, foliis 4-natim verticillatis pinnatipartitis rhachi serratis, filamentis anticis hirsutis, floribus sordide albidis . . . . . *P. pycnantha.*
bracteis 3-fidis, ovario ovoideo, foliis 3-natim verticillatis pinnatisectis rhachi integris, filamentis glabris, floribus purpureis . . *P. Bourgeaui.*

Labio galeam æquante, foliis pinnatisectis rhachi integris, capsula calyce longiore:—
bracteis rhombeis 3-fidis serratisque, foliis oppositis, corollæ tubo elongato extra calycem incurvo, labio lobis rotundatis medio ad basin valde constricto, filamentis glabris, floribus roseis . . *P. cadmea.*
bracteis ovatis serrulatis, foliis 4-natim verticillatis corollæ tubo intra calycem incurvo labio lobis emarginatis medio sessili, filamentis anticis hirsutis, floribus albis . . . . . *P. caucasica.*

71. Brevilabres.

P. densiflora *Benth.; Hook., Flor. Bor. Amer.* ii, 110, (notul.)
P. bracteosa *Benth.; Hook., Flor. Bor. Amer.* ii, 110.

Elatæ foliosæ foliis sparsis pinnatifidis laciniis inciso-serratis, spicis densis multifloris foliosis calyce nec fisso dentibus subulatis, corollæ tubo recto exserto labio galea multoties breviore porrecto accumbente, filamentis omnibus glabris.

Galea recta angulo inferiore obtuso . . . . . *P. densiflora.*
Galea apice adunca angulo inferiore acuto . . . . . *P. bracteosa.*

72. Foliosæ.

P. Wilhelmsiana *Fisch.; M. Bieb., Flor. Taur. Cauc.* iii, 412.
P. sajanensis *Steph.; Bunge, Ledeb. Flor. Ross.* iii, 298.
P. condensata, *M. Bieb.; Flor. Taur. Cauc.* ii, 72.
P. foliosa *Linn.; Mantiss. Plant.* 86.

Elatæ foliosæ foliis sparsis pinnatifidis laciniis inciso-serratis, spicis densis multifloris foliosis calyce nec fisso dentibus æqualibus integris corollæ tubo recto vel leviter incurvo exserto, labio galeam subæquante patulo, galea angulo frontali superiore rotundato inferiore acuto, filamentis omnibus hirsutis.

Calyce dentibus linearibus galea glabriuscula fronte obtusa, capsula late ovata obliqua calycem excedente . . . . . *P. Wilhelmsiana.*

Calyce dentibus deltoideis :—

galea subrostrata glabra . . . . . *P. sajanensis*

galea fronte obtusa :—

galea glabra capsula obovata æquali calyce inclusa . . . *P. condensata.*

galea villosa capsula oblique ovata et mucronata . . . *P. foliosa.*

73. Exaltatæ.

P. atropurpurea *Nordm.; Bull. Acad. Sc. St. Petersb.* ii, 313.
P. exaltata *Besser; Flora* ii (1832), *Beiblätt.* 19.
P. sumana *Spreng.; Pl. Nov.* ii, 70.

Elatæ foliosæ foliis sparsis pinnatifidis laciniis inciso-serratis, spicis densis multifloris foliosis calyce antice fisso dentibus æqualibus integris corollæ tubo recto vel leviter incurvo exserto labio galeam subæquante patulo, galea angulo superiore rotundato inferiore acuto, filamentis anticis dense hirsutis posticis glabris vel leviter barbatis.

Galea infra apicem brevissime dentata margine glabra filamentis anticis tantum hirsutis, corolla atropurpurea . . . . . *P. atropurpurea.*

Galea edentata margine pubescente filamentis anticis dense posticis leviter hirsutis, corolla ochroleuca :—

tubo corollæ glabro caule elato polyphyllo . . . . . *P. exaltata.*

tubo corollæ intus hirsuto, caule superne tantum foliato . . *P. sumana.*

74. Limnogena.

P. limnogena *Kerner; Oesterr. Bot. Zeitschr.* xiii, 362.

Humilis caulibus simplicibus, foliis lanceolatis pinnatifidis segmentis ovato-lanceolatis serrato-dentatis caulinis sparsis paucis radicalia cæspitosa excedentibus, spica terminali longiuscula calyce campanulato pedicellato nec fisso dentibus deltoideis integris corollæ tubo recto exserto labio galeam subæquante patulo, filamentis anticis hirsutis.

Coroïla parvula, capsula calyce 2-plo longiore . . . . . *P. limnogena.*

75. Roseæ.

P. rosea *Wulf.; Jacq., Miscell* ii, 57.
P. orthantha *Griseb.; Spicil. Fl. Rumel.* ii, 15.

Humiles caulibus simplicibus foliis oblongo-lanceolatis pinnatisectis segmentis anguste lanceolatis serratis caulinis sparsis paucis radicalibus cæspitosis minoribus, spica brevi

calyce campanulato nec fisso profunde dentato dentibus angustis integris corollæ tubo recto exserto galea angulo superiore obtuso inferiore acuto labio galeam subæquante patulo.

Filamentis omnibus hirsutis . . . . . *P. rosea.*
Filamentis anticis hirsutis . . . . . *P. orthantha.*

76. Hirsuta centripeta.

P. Langsdorfii *Fisch.; Stev., Monogr. Pedic.* 49.

Humilis vel elatior hirsuta foliis pectinatifidis sparsis spica laxa centripeta calyce campanulato corollæ tubo recto exserto labio galea breviore patulo, galea obtusissima infra apicem minutissime bidenticulata.

Galea rosea filamentis omnibus hirsutis . . . . . *P. Langsdorfii.*

77. Hirsutæ veræ.

P. lanata *Willd.; ex Cham. et Schlecht., Linnæa* ii, 584.
P. hirsuta *Linn.; Sp. Plant.* 609.
P. olympica *Boiss.; Diagn.*, ser. 1, 4, p. 83.

Humiles hirsutæ (glabriuscula *P. olympica*) foliis pectinatifidis sparsis spica densa centrifuga calyce campanulato corollæ roseæ tubo recto exserto labio patulo galea obtusissima.

Spica albo-lanata galeæ apice deorsum acutiusculo inferne passim 2-denticulato staminibus anticis hirsutis . . . . . *P. lanata.*

Spica non albo-lanata galea utroque angulo obtusa filamentis omnibus glabris:—

caule cum spica lanato labio galeam subæquante . . . . . *P. hirsuta.*
caule cum spica glabriusculo labio galea breviore . . . . . *P. olympica.*

78. Flammeæ.

P. Oederi *Vahl; Hornem., Oekon. Plantel.*, ed. ii, 580.
P. Alberti *Regel; Act. Hort. Petrop.* vi, 353.
P. flammea *Linn.; Sp. Plant.* 609.

Humiles hirsutæ foliis pinnatifidis sparsis spica densa centrifuga calyce campanulato corolla citrina cum vel sine maculis duabus ad galeam tubo recto exserto labio patulo galea breviore.

Galea apice deorsum acutiuscula, filamentis anticis hirsutis, foliis subruncinatis, corolla brunneo-maculata . . . . . *P. Oederi.*

Galea obtusissima filamentis omnibus glabris:—

foliis pinnatifidis rhachi serratis corolla concolore citrina . . *P. Alberti.*
foliis subruncinatis corolla brunneo-maculata . . . . . *P. flammea.*

CHAPTER VII.—SPECIERUM INDICARUM CLAVIS ARTIFICIALIS.

Galea rostrata;

staminibus apice tubi æqualis insertis;

foliis sparsis;

filamentis omnibus hirsutis;

calyce campanulato, 3-dentato, antice ad medium fisso;

floribus luteis . . . . . *P. longiflora* . . . 2

calyce oblongo, 5-dentato, antice vix fisso; floribus purpureis;

rostro flexuoso apice emarginato . . . . . *P. bella* 8

rostro porrecto profunde 2-fido . . . . . *P. Przewalskii* . . 9

filamentis anticis hirsutis, floribus purpureis;

rostro apice integro, calyce 5-dentato . . . . . *P. rhinanthoides* . . 1

rostro apice 2-fido;

calyce 5-dentato, galea fauce edentata . . . *P. megalantha* . . 6

calyce 3-dentato, galea fauce utrinque 1-dentata *P. siphonantha* . . 3

filamentis omnibus glabris, floribus luteis;

rostro longissimo apice resupinato integro . . . *P. elephantoides* . . 5

rostro profunde 2-fido, galea fauce contorta . . *P. biconruta* . . . 4

foliis oppositis;

filamentis omnibus hirsutis, floribus purpureis . . . . *P. integrifolia* . . 17

staminibus infra apicem (sæpius medio, nonnunquam infra medium) tubi plus minus sursum ampliati insertis;

foliis sparsis;

filamentis omnibus hirsutis;

rostro labium saltem æquante, floribus purpureis, filamentis medio tubo insertis;

rostro circinnato apice 2-fido;

calyce ovato ad basin usque fisso, labio ciliato . . . . . *P. Elwesii* . . . 16

calyce campanulato ad medium fisso, labio glabro lobis rotundis . . . . . *P. macrantha* . . 14

calyce oblongo vix fisso, labio glabro lobo medio oblongo . . . . . *P. Garckeana* . . 11

rostro recto apice 2-fido, calyce oblongo vix fisso *P. Daltoni* . . . 10

rostro recto apice truncato-emarginato, calyce subinflato nec fisso . . . . . *P. Wallichii* . . . 13

rostro falcato apice acuto integro calyce campanulato nec fisso . . . . . *P. gruina* 34

rostro labio manifeste breviore apice 2-fido;

rostro deorsum spectante, filamentis medio tubo insertis;

calyce campanulato ad medium fisso, floribus luteis . . . . . *P. Scullyana* . . . 15

Galea rostrata—*continuata.*

calyce oblongo vix fisso, floribus purpureis; tubo calycem æquante, labii lobis margine integris æquilatis . . .	*P. robusta* . . .	12
tubo calyce 2-plo longiore, labii lobis margine crenulatis medio reliquis minore	*P. nepalensis* . . .	13
rostro horizontali, filamentis ex adverso summi ovarii insertis	*P. flagellaris* . . .	35
filamentis anticis hirsutis, floribus puniceis; galea fauce utrinque 1-dentata, filamentis medio tubo insertis	*P. odontophora* . .	41
galea fauce edentata, filamentis ex adverso summi ovarii insertis	*P. Pantlingii* . .	32
filamentis omnibus glabris; labio stipitato; floribus puniceis; labio e lata basi sensim attenuata lobis parvulis, filamentis basi tubi insertis	*P. excelsa*	44
labio anguste stipitato lobis ovatis acutis, galea dorso parce pilosa; rostro apice 2-fido, filamentis ex adverso summi ovarii insertis	*P. Clarkei* . . .	47
rostro apice integro penicillato-villoso, filamentis medio tubo insertis	*P. lachnoglossa* . .	45
labio sessili; galea dense hirsuta rostro falcato apice integro, filamentis prope basin tubi insertis, floribus purpureis	*P. trichoglossa* . .	46
galea glabra rostro porrecto; labio margine ciliato lobis rotundatis, floribus puniceis; rostro apice emarginato, filamentis ex adverso summi ovarii insertis . .	*P. carnosa* . . .	37
rostro 2-fido, filamentis medio tubo nsertis	*P. microcalyx* . .	33
labio margine eciliato; labio lobis truncatis rostro 2-fido, filamentis ex adverso summi ovarii insertis, floribus puniceis	*P. furfuracea* . .	31
labio lobis rotundatis rostro crenato nec 2-fido, filamentis mediot ubo insertis, floribus albis	*P. albiflora* . . .	42
foliis oppositis vel verticillatis; filamentis omnibus hirsutis; staminibus ex adverso summi ovarii in sacculo transverso insertis ibique villosis; foliis caulinis sessilibus, floribus luteis . . .	*P. tenuirostris* . .	19
foliis caulinis radicalibusque petiolatis, floribus purpureis	*P. pectinata* . . .	18

Galea rostrata—*conclusa.*

staminibus medio tubo insertis hinc glabris, foliis caulinis petiolatis, floribus purpureis . . . . . *P. pyramidata* . . 20

filamentis anticis hirsutis;

rostro apice integro, tubo calycem vix excedente;

rostro truncato labio breviore, staminibus ex adverso summi ovarii insertis, floribus luteis *P. alaschanica* . . 51

rostro acuto labio æquilongo, staminibus medio tubo insertis, floribus puniceis . . . . . *P. tenuicaulis* . . 30

rostro apice inciso, tubo calyce longiore, filamentis medio tubo insertis, floribus purpureis;

calyce vix fisso, rostro truncato apice laciniato *P. schizorrhyncha* . 50

calyce triente fisso, rostro apice emarginato;

rostro horizontali labium æquante, foliis pinnatifidis oppositis . . . . . *P. flexuosa* . . . 28

rostro deflexo labio breviore, foliis parvulis 2-pinnatipartitis 4-natim verticillatis . *P. Gammieana* . . 49

filamentis omnibus glabris, floribus purpureis;

rostro labio longiore apice integro, calyce nec fisso;

rostro flexuoso, staminibus medio tubo insertis . . . . . *P. Oliveriana* . . 21

rostro recto, labio parvulo, staminibus supra medium tubum insertis . . . . . *P. Heydei* . . . 25

rostro recto labium æquante;

calyce antice $\frac{1}{3}$ fisso, rostro integro, labio 3-fido, tubo calyce triplo longiore . . . . . *P. chumbica* . . . 29

calyce nec fisso;

rostro 2-fido, labio 3-fido, staminibus ex adverso summi ovarii insertis, tubo calyce $\frac{1}{2}$ longiore . . . . . *P. brevifolia* . . . 22

rostro apice integro;

labio 3-partito, staminibus medio tubo insertis, tubo calyce $\frac{1}{2}$ longiore . . *P. instar* 23

labio tantum 3-fido;

staminibus supra medium tubum insertis, tubo calyce $\frac{1}{2}$ longiore, floribus paucis axillaribus . . *P. porrecta* . . . 26

staminibus medio tubo insertis;

tubo calyce duplo longiore, floribus confertis . . . . *P. confertiflora* . . 27

tubo calycem vix excedente, floribus paniculato-racemosis *P. gracilis* . . . 24

Galea erostri vel brevissime latirostrata;

galea infra apicem utrinque dentata;

foliis sparsis;

filamentis anticis hirsutis, galea distincte rostrata, floribus ochroleucis . . . . . *P. dolichorrhiza* . 55

Galea erostri vel brevissime latirostrata—*continuata.*

foliis oppositis vel verticillatis;

filamentis omnibus hirsutis, galea utrinque 1-dentata, floribus luteis . . . . . *P. rex* 54

filamentis anticis hirsutis, galea utrinque 1-dentata;

labio anguste stipitato lobis lateralibus medio minoribus, floribus viridibus . . . . . *P. fragilis* . . . 66

labio e lata basi stipitato, floribus purpureis;

tubo incurvo labio lobis lateralibus medio majoribus, galea incurva dentibus distinctis . *P. comptoniæfolia* . 53

tubo recto labio lobis supparibus, galea recta dentibus minutissimis . . . . . *P. collata* . . . 65

filamentis omnibus glabris, galea utrinque 3-dentata, floribus albis . . . . . *P. lyrata* 52

galea edentata;

foliis sparsis;

filamentis omnibus hirsutis anticis tamen densioribus, galea leviter cristata; planta acaulis . . . . . *P. Regeliana* . . . 56

filamentis anticis hirsutis . . . . . *P. Oederi* . . . 69

filamentis omnibus glabris;

calyce 5-dentato, labio lobis æquilatis, staminibus medio tubo vel supra medium insertis;

tubo calyce 4-plo longiore, labio lobis obovatis, floribus albis . . . . . *P. Perrottetii* . . 7

tubo calycem vix excedente, labio lobis ovatis acutis, floribus luteis . . . . . *P. Prainiana* . . 48

calyce 2-fido, staminibus ex adverso summi ovarii insertis, floribus purpureis;

tubo calyce 2-plo longiore, galea labium excedente *P. corymbosa* . . 38

tubo calycem vix excedente;

galea labio longiore; foliis scabris . . . *P. Collettii* . . . 40

galea labio breviore . . . . . *P. zeylanica* . . . 39

foliis oppositis vel verticillatis;

filamentis omnibus hirsutis, floribus purpureis . . . . *P. denudata* . . . 63

filamentis anticis hirsutis;

staminibus imo tubo insertis, tubo recto, labio parvulo lobis lateralibus medio angustioribus, floribus albis . . . . . *P. Kingii* . . . 67

staminibus medio tubo insertis;

tubo medio incurvo, labio lobis lateralibus medio duplo latioribus, floribus sordide albis . . . *P. pycnantha* . . . 68

tubo apice infracto, labio lobis æquilatis, floribus puniceis . . . . . *P. gibbera* . . . 61

filamentis omnibus glabris;

labio margine ciliato lobis æquilatis, tubo apice infracto, staminibus imo tubo insertis . . . . *P. mollis* . . . 64

Galea erostri vel brevissime latirostrata—*conclusa*.		
labio margine glabro, floribus puniceis;		
labio lobis æquilatis, tubo intra calycem infracto, staminibus ex adverso summi ovarii insertis;		
galea fronte decliva	*P. globifera* . . .	57
galea fronte truncata	*P. cheilanthifolia* .	58
labio lobo medio lateralibus minore, staminibus ex adverso tubi infractionis insertis;		
tubo ipso apice infracto	*P. polygaloides* . .	62
tubo intra calycem infracto;		
galea acuminata labium superante .	*P. ophiocephala* . .	59
galea labio manifesto breviore . . .	*P. Roylei*	60
(Galea ignota);		
foliis sparsis; pedicellis fructiferis resupinatis;		
(filamentis ignotis);		
staminibus ex adverso summi ovarii insertis;		
calyce 2-fido segmentis ex angusta basi ovatis serratis .	*P. curvipes*, . . .	36

PART III—DESCRIPTIONS OF THE INDIAN SPECIES.

DIVISIO I.—LONGIROSTRES Maxim.

§ Siphonanthæ Benth.

Foliis alternis; floribus quasi centrifugo ordine apertis :—
calyce dente summo integro reliquis serratis :—
calyce 5-dentato . . . . . 1. *P. rhinanthoides.*
calyce 3-dentato :—
filamentis omnibus hirsutis . . . . . 2. *P. longiflora.*
filamentis anticis hirsutis . . . . . 3. *P. siphonantha.*
calyce dentibus omnibus serratis :—
corollæ tubo æquali, filamentis apice tubi insertis :—
filamentis omnibus glabris :—
galea rostrata :—
rostro apice profunde 2-fido, fauce contorta . . 4. *P. bicornuta.*
rostro rectiusculo apice integro, fauce plana . . 5. *P. elephantoides.*
galea erostri . . . . . 7. *P. Perroiteii.*
filamentis anticis hirsutis . . . . . 6. *P. megalantha.*
filamentis omnibus hirsutis :—
rostro sigmoideo, labio lobo medio minimo . . . . 8. *P. bella.*
rostro porrecto 2-fido horizontali, lobis supparibus . 9. *P. Przewalskii.*
corollæ tubo sursum parum ampliato, filamentis medio tubo insertis omnibus hirsutis :—
calyce oblongo antice vix fisso :—
rostro horizontali recto . . . . . 10. *P. Daltoni.*
rostro circinnato . . . . . 11. *P. Garckeana.*
rostro deorsum directo recto brevi :—
tubo calycem æquante . . . . . 12. *P. robusta.*
tubo calyce 2-plo longiore . . . . . 13. *P. nepalensis*
calyce ovato antice fisso :—
calyce $\frac{1}{3}$ fisso labio eciliato :—
lobis supparibus, floribus purpureis vel ochroleucis 14. *P. macrantha.*
lobo medio minore, floribus luteis . . . . . 15. *P. Scullyana.*
calyce fere ad basin usque fisso, labio margine dense ciliato . . . . . 16. *P. Elwesii.*
Foliis oppositis, floribus manifeste centripetis . . . . . 17. *P. integrifolia.*

1. Pedicularis rhinanthoides *Schrenk* (1841).

Nana vel elata glabrata rhizomate brevi radicibus cæspitosis fusiformibus caulibus arcuatis foliis lineari-oblongis radicalibus cæspitosis longe petiolatis pinnatisectis segmentis 9—12-jugis ovatis mucronato-dentatis caulinis paucis sparsis breve petiolatis floribus axillaribus pedicellatis racemis densifloris calycis ovati antice ad medium fissi 5-dentati segmento summo lanceolato integro reliquis ovatis mucronato-dentatis minore corollæ tubo caly-

cem fere duplo superante labio 3-fido lobis rotundatis margine eciliatis lateralibus dorso corollæ sese tegentibus medio duplo latioribus galea subinflata angulo subrecto incurva parte basali tubo dimidio latiore antice inclinata fauce integra vel rarius 2-auriculata parte antherigera horizontali in rostrum tenue apice acuto integro sensim abeunti staminibus apice tubi insertis filamentis anticis hirsutis ovario lanceolato stigmate exserto capsula calyce sesquilongiore ovato-oblonga apice oblique acuminata seminibus apice antice cristatis ovoideis pallidis distincte reticulatis.

VAR. *typica;* rostro galeam subæquante labium vix excedente.—P. rhinanthoides *Schrenk in Fisch. et Mey., Enum. Pl. Nov.* i, 22; *Walp., Rep.* iii, 413; *Benth., DC. Prodr.* x, 565; *Bunge, Ledeb., Flor. Ross.* iii, 276; *Prain, Jour. As. Soc. Beng.* lviii, 2, 272.—P. Elephas *Benth., DC. Prodr.* x, 565, *pro parte* (1846); *Boiss., Flor. Orient* iv, 489 (*pro parte nec Diagn.* 1, 4, 81).

In alpibus HINDU-KUSH; in valle Hadji-gak ad nives, 10,500 p. s. m., *Griffith* (Journ. 1060)!

DISTRIB.—In alpibus Alatau et in Turkestania.

VAR. *labellata;* rostro galea fere duplo longiore labium longe excedente.—P. labellata *Jacquem. mss., Dcne in Jacquem. Voy., Bot.* 117, *t.* 122 (1844); *Walp., Rep.* iii, 414; *Benth., DC. Prodr.* x, 565.—P. rhinanthoides *Hook. f., Flor. Brit. Ind.* iv, 314 (*syn. omn. exclus.*) (1884).—P. siphonantha *Hook. f., Flor. Brit. Ind.* iv, 313 (*pro parte nec Don*) (1884).

In HIMALAYA occidentali:—Gatong Ghauti, 18,300 p. s. m., *Jacquemont;* Zirkotal, *Falconer!* Kunawar, *Vicary!* Lanak, 12,000 p. s. m., *Thomson!* Lahul, *Hay!* Sai, 13,000 p. s. m., *Tanner!* Ladak, 11,000 p. s. m., *Jæschke!* Karnag, 14—17,000 p. s. m.; Rupschu, 15—18,000 p. s. m.; Chandra, 12—13,000 p. s. m.; Kibler, 14—15,500 p. s. m.; Gieumal, 15,000 p. s. m.; Ishomori et Tehra, 15—17,000 p. s. m.; *Stoliczka!* Pangi, 11—16,500 p. s. m., *Heyde!* In Himalaya orientali:—Phari; apud Kangma et ad ripas fluminis Pe-namong Chu, et in aliis locis, *Kingii mercenar!*

DISTRIB.—In Yarkand, in Kansu, in Tibet boreali et in Yunnan.

Caulibus 3·5—30 cm. altis; foliorum petiolis 2—5 cm. his caulinorum sæpius basi dilatatis, segmentis 5 mm. sæpissime distantibus; pedicellis 5—9 mm., calyce 12—15 mm., corollæ tubo VAR. *typicæ* 18 mm. VAR. *labellatæ* 25—28 mm. longo, galeæ parte basali 4 × 4 mm. parte antherigera 6 × 3·5 mm. rostro VAR. *typicæ* 3—5 mm. VAR. *labellatæ* 8—10 mm. labio VAR. *typicæ* 16 mm. lato VAR. *labellatæ* 25—28 mm.; capsula 19 mm. longa 6 mm. lata basi oblonga seminibus 2 mm. longis.

PLATE 1. A—D; figs. 1—8.—P. rhinanthoides *Schrenk.*

A—Specimen of VAR. *typica* from Hadji-gak.
B— „ of „ „ from Sairam, Turkestan.
C— „ of form connecting VAR. *typica* with VAR. *labellata* from Tehri-Garhwal.
D—Specimen of VAR. *labellata* from Pangi.
Fig. 8. is from a specimen of VAR. *labellata* from Rupschu.

The description is based on an examination of 13 individual specimens of VAR. *typica* and of 48 specimens of VAR. *labellata.*

Mr. Maximowicz in 1877 (*Mel. Biol.* x, 82) diagnosed *P. rhinanthoides* from *P. labellata* as follows:—

filaments glabrous, beak shorter than the 2-dentate galea, whole plant a span high . . . . . *P. rhinanthoides;*
anterior filaments hirsute, beak longer than the edentulous galea . . *P. labellata;*

adding to the diagnosis in 1888 (*Mel. Biol.* xii, 786), as regards *P. rhinanthoides*, "very like *P. labellata.*" The original plant is not at Calcutta, but specimens from Sairam, Turkestan, collected by Mr. A. Regel and named by Mr. Maximowicz have been examined. In these the anterior stamens are hirsute, as MM. Fischer and Meyer say they found them in Schrenk's specimens and not, as Bunge tells us he found them (*l.c.* 276),[1] all glabrous. In Griffith's specimens, (Jour. 1060), the anterior stamens are hirsute, and not, as M. Boissier (*l.c.*) indicates, all glabrous. The hairs on the filaments of VAR. *typica* are not numerous, but appear to be usually present; I have not found them once absent in 23 individual corollas analysed. Thus the principal diagnostic character fails. Nor do any of the other characters hold; Himalayan specimens of "*P. labellata*" vary a great deal in size, but have the beak very uniformly twice the length of the hood, while specimens from Phari (of which I have examined 11), though not exceeding 12 cm. in height, have the beak thrice the length of the hood. On the other hand, the gathering from Bamsor (Duthie 576) consists of dwarf specimens with the short beak of VAR. *typica*, but with the densely hairy anterior filaments of "*P. labellata*" Among the 48 specimens of "*P. labellata*" in the herbaria of Calcutta and Saharanpur examined by me, 43 have edentulous corollas, 4 have the throat 2-auriculate (a flower from one of these is shown in Plate 1, fig. 8), and one from Zalang Karpo in Karnag collected by Dr. Stoliczka has the throat on both sides very distinctly toothed, the teeth being much longer than in any specimen of *P. siphonantha*, a species in which this character is a normal one. It is not therefore possible to consider *P. labellata* specifically separable from *P. rhinanthoides.*

Dr. Griffith's Hadji-gak plant, referred by Mr. Bentham to *P. Elephas* Boissier in 1846, is by Boissier himself, so recently as 1879, only doubtfully placed there. And this cannot be its position, since Boissier describes *P. Elephas* as having the apex of the beak 2-fid, whereas the apex of beak in Griffith's plant, which agrees completely with Fischer and Meyer's description of *P. rhinanthoides*, and is precisely the same as A. Regel's Sairam specimens, is entire. Genuine *P. Elephas*, on the other hand, cannot be satisfactorily diagnosed from *P. siphonantha.* But another Griffithian specimen referred by Bentham *l.c.* to *P. labellata* is not that plant, but is *P. siphonantha* VAR. *brevituba;* consequently *P. labellata* Boiss. (*l.c.* 489), which depends on this specimen alone, is not the same as *P. labellata* Jacq., but is = *P. siphonantha* Don. Sir J. D. Hooker, *l.c.* 313, reduces *P. labellata* to *P. siphonantha;* the following are the diagnostic characters of the two species:—

calyx 5-toothed, margin of lip eciliate, lobes not emarginate, basal portion of hood inclined forward, beak entire at apex . . . *P. rhinanthoides;*
calyx 3-toothed, margin of lip ciliate, midlobe emarginate, basal portion of hood erect, beak 2-fid at apex . . . . . *P. siphonantha*

[1] In every case in which the letters *l.c.* are employed the reference is to the synonymy that follows the specific description of the particular species under review, and not to any other part of the text

P. rhinanthoides flowers in June in Alatau, in July in Hindu-Kush, and in August in the Himalaya; the flowers are purple or pink, sometimes pale rose; in one gathering it is noted as having white flowers with salmon-coloured spots.

2. Pedicularis longiflora *Rudolph* (1811).

Nana vel elata glabrata rhizomate brevi radicibus cæspitosis fusiformibus caulibus centrali erecto excepto arcuate ascendentibus foliis radicalibus cæspitosis petiolatis pinnatisectis segmentis 5—8-jugis lanceolatis pinnatifidis -partitisve laciniis serratis caulinis numerosis sparsis breve petiolatis petiolis glabris vel margine hirsutis floribus axillaribus pedicellatis racemis densifloris calycis anguste ovati antice ad medium fissi 3-dentati segmento summo subulato vel 0 integro lateralibus lanceolatis serrato-dentatis (raro integris et rarissime divisis) minore corollæ tubo extus pubescente calycem 4—7-plo superante labio 3-fido lobis emarginatis margine ciliatis lateralibus medio dimidio latioribus galea subinflata circinnate incurva parte basali tubo æquilata erecta fauce integra vel 2-sinuata parte antherigera falcata in rostrum tenue apice obtuso 2-fido sensim abeunti staminibus apice tubi insertis filamentis omnibus hirsutis ovario lanceolato stigmate exserto capsula calyce sesquilongiore ovata apice acuta seminibus apice subcristatis ovoideis nigris striatis vix reticulatis.—P. longiflora *Rudolph, Mem. Acad. Petersb.* iv, 345, *t.* 3; *Spreng., Syst. Veg.* ii, 777; *Bunge, Ledeb. Flor. Ross.* iii, 276; *Maxim., Mel. Biol.* x, 86; *Prain, Jour. As. Soc. Beng.* lviii, 2, 272.—P. tubiflora *Fisch., Mem. Soc. Mosc.* iii, 58 (1812); *Steven, Monogr. Pedic.* 30; *Walp., Rep.* iii, 413; *Benth., DC. Prodr.* x, 565; *Hook. f., Flor. Brit. Ind.* iv, 314. —P. tubiformis *Klotzsch, Reis. Pr. Wald., Bot.* 106, *t.* 57 (1862).

In Himalaya occidentali:—Drankar, 12,000 p. s. m., *Thomson!* Lahul, *Hay!* Lei, 12—14,000 p. s. m.; Rupschu, 15—18,000 p. s. m.; Kibler, 14—15,500 p. s. m.; Drankar, 12,300 p. s. m.; Lanak, 15—18,000 p. s. m.; prope Chikkim, 13,500—15,500 p. s. m.; apud Ishomoriri et prope Kargil, *Stoliczka!* Mashow, 11,000 p. s. m., *Brandis!* Pangi, 11—16,500 p. s. m., *Heyde!* Kamaon; *Hoffmeister, Strachey et Winterbottom;* in valle Ralam, 11—12,000 p. s m., et apud Kuthi in valle Byas, 12—13,000 p. s. m., *Duthie* 3,232! In Himalaya orientali:—apud Jongri, 13,000 p. s. m., *Kingii mercenar.!* Sikkim, 12—14,000 p. s. m., *Hooker! Jaffrey!* Lachoong, 9,000 p. s. m., *Pantling!* apud Tan-ka-la, Cho-la, Chop-ta et Ta-lung Pa-dong, 11—13,000 p. s. m., *Kingii mercenar.!* Chumbi; apud Toong-shong, apud Ree-dong-oong et in locis aliis plurimis, *Kingii mercenar.!* Phari, apud Kangma et ad ripas fl. Pe-na-mong Chu, *Kingii mercenar.!* Bootan; La-ree, 13,000 p. s. m., *Kingii mercenar.!*

Distrib.—In Siberia baicalensi et in Mongolia boreali frequens; in Tibet boreali atque in China boreali.

Caulibus 2—20 cm. altis; foliorum petiolis 1—3·5 cm., segmentis 3 mm. contiguis; pedicellis 3—10 mm., calyce 10—12 mm., corollæ tubo 45—65 mm., galeæ parte basali 3 mm. parte antherigera 4 mm. rostro 6 mm. parum bifido segmentis rotundatis labio 14 mm. lato; capsula 19 mm. longa 5 mm. lata basi angustata antice sinuata seminibus 2mm. longis.

Plate 1. E, F; figs. 10—16.—P. longiflora *Rudolph.*

E—Specimen from Ladak, W. Tibet.
F— „ „ Reedong, Chumbi.
Fig. 10.—Five differently-toothed calyces, all from a single specimen from Jongri

This description of *P. longiflora* is based on an examination of 109 separate specimens and on the dissection of flowers from specimens of 53 different gatherings.

P. tubiformis Klotzsch is only a tall form of the species.

Of 40 gatherings at Calcutta, where the colour of the corolla has been noted, 31 are yellow-flowered, two Sikkim gatherings have white flowers, and one from Kang-ma in Phari has yellow tube and lip with purple galea. Mr. Maximowicz finds that the lower lip of specimens from Burchan-Budda in N. Tibet has two cuneate purple marks, and the same thing is seen in some of the Calcutta specimens from Jongri.

Of Indian species this comes nearest to *P. siphonantha;* the diagnosis is as follows:—

all lobes of lip emarginate, galea throat 2-sinuate, all filaments hirsute *P. longiflora;*
only central lobe distinctly emarginate, galea throat 2-dentate, only anterior filaments hirsute . . . . . *P. siphonantha.*

Fruiting specimens also are easily diagnosed; in *P. longiflora* the capsule is sinuate anteriorly and the seeds are black, striate, but not reticulated; in *P. siphonantha* the capsule is not sinuate, the seeds are pale and distinctly reticulated.

Of extra-Indian species *P. chinensis* Maxim., a distinct species in habit, stature, leaves, and calyx much like certain forms of *P. megalantha*, comes near to this, but differs in having the lateral lobes of the lip rounded, not truncate, and in having the apex of the beak of corolla entire. A specimen of the original gathering of *P. chinensis* has been kindly sent to Calcutta by Mr. Maximowicz. Certain specimens from North China (Potanin, 1885) issued as "P. chinensis" from the St. Petersburg Herbarium are, however, only *P. tubiformis* Klotzsch, and therefore are merely tall forms of *P. longiflora* Rudolph.

The only author who has followed Steven in giving Fischer's name for the species, and who has at the same time quoted Rudolph's name (as a synonym), has been Walpers. He (*l.c.*) has taken the deliberate, if somewhat unusual, step of indicating that the name which he keeps subordinate was published in 1811, and at the same time shows that he supposes the name which he accepts to have been first published in Steven's work, *i.e.*, in 1823, or 12 years later than the date of his synonym.

3. **Pedicularis siphonantha** *Don* (1825); *Hook f., Flor. Brit. Ind.* iv, 313 (*syn.* P. labellata *atque* P. Hoffmeisteri *exclusis)* (1884).

Nana vel elata glabra vel pubescens rhizomate ramoso radicibus fusiformibus caulibus decumbentibus vel ascendentibus foliis radicalibus cæspitosis petiolatis pinnatisectis segmentis 8—15-jugis lanceolatis ovatisve pinnatifidis vel dentatis caulinis paucis sparsis breve petiolatis floribus axillaribus pedicellatis racemis densifloris calycis ovati antice infra medium fissi 3-dentati segmento summo subulato vel 0 integro lateralibus ovatis serrato-dentatis nonnunquam divisis minore corollæ tubo calycem 2—5-plo superante labio 3-fido margine ciliato lobis lateralibus subrotundatis dorso corollæ sese tegentibus medio emarginato dimidio latioribus galea subinflata circinnate incurva parte basali tubo dimidio latiore erecta fauce 2-dentata -auriculatave parte antherigera falcata in rostrum tenue apice obtuso 2-fido sensim abeunti staminibus apice tubi insertis filamentis anticis hirsutis ovario lanceolato stigmate exserto capsula calyce sesquilongiore ovato-oblonga apice subrecte acuminata seminibus apice antice cristatis ovoideis pallidis distincte reticulatis.

VAR. *typica;* corollæ tubo calycem 4—5 plo superante galea fauce acutiuscule 2-dentata; foliorum segmentis lanceolatis.—P. siphonantha *Don, Prodr. Flor. Nepal.* 95; *Wall., Cat.* 417; *Benth., Scroph. Ind.* 53; *Walp., Rep.* iii, 413; *Benth., DC. Prodr.* x, 565; *Maxim., Mel. Biol.* xii, 796.—P. Hookeriana *Wall., Cat.* 421 (1828); *Benth., Scroph. Ind.*, 53; *Walp., Rep.* iii, 413; *Benth., DC. Prodr.* x, 564.—P. himalayca *Klotzsch, Reis. Pr. Wald., Bot.* 107, *t.* 58 (1862).

In HIMALAYA occidentali:—Tibet occidentali, *Reeves! Falconerii mercenar.* (sæpissime)! Lahul, *Hay! Watt!* Gilgit, *Giles!* Kashmir, *Royle! Sedgwick!* Chenie, *Stewart!* Chamba, *Ellis!* Pangi, *Brandis! Stoliczka!* Zanskar, *Stoliczka!* Sirmur, *Vicary!* Kamaon, *Wallich!* Simla, *Royle!* Kundu, 9,000 p s. m. et Jakko, 11,000 p. s. m., *Schlich!* Pindir, 12,000 p. s. m., prope nives glacie coacervatas, *Coliett!* Dharma, 11—12,000 p. s. m., *Duthie! Reid!* in valle Ralam, 13—15,000 p. s. m. et apud Taulea, infra Srikanta, 12—13,000 p. s. m., *Duthie!* Tehri; in valle Damdar, 14,000 p. s. m. et prope Dudu infra Srikanta, *Duthie!* Garhwal; prope Kuari, 12—13,000 p. s. m. et supra Bhowani, *Duthie!* Nepal occidentali; Budhi, 10—11,000 p. s. m. et Palang Gadh, *Duthie!* Nepal centrali; in Gosain Than, *Wallich! Scully!* In Himalaya orientali:—Jongri, 14,000 p. s. m., *Watt! Kingii mercenar.* (sæpissime)! Sikkim; 11—15,000 p. s. m., *Hooker! Kurz! Jaffrey!* Langmang-nang-zo, 10,000 p. s. m. et Yeumtong, 11,000 p. s. m., *Pantling!* Saiboo-la, 15,000 p. s. m.; Donkia-la, 14,500 p. s. m.; Beeroom, 13,000 p. s. m.; Gia-gong, 13,000 p s. m.; Na-tong; Ze-lep-la; Too-koo-la; Boo-tang; Koo-ma-pya; Retchi-la et apud Chun-goo infra Natoot in partibus ad Sikkim pertinentibus; Chumbi, sed infrequens, *Kingii mercenar.!*

DISTRIB.—In Chinæ prov. Sze-tschuan.

VAR. *brevituba;* corollæ tubo calycem 2—3-plo excedente galea fauce obtuse 2-auriculata vel integra; foliorum segmentis ovatis.—P. punctata *Dcne in Jacquem. Voy., Bot.* 111, *t.* 122 (1844); *Walp., Rep.* iii, 414; *Benth., DC. Prodr.* x, 564.—P. Elephas *Boiss., Diagn.* ser. 1, 4, 81 (1844); *Walp., Rep.* iii, 414; *Benth., DC. Prodr.* x, 565 (*pro parte*); *Boiss., Flor. Orient.* iv, 489 (*pro parte*).—P. labellata *Benth., DC. Prodr.* x, 565 (*pro parte*) (1846); *Boiss., Flor. Orient.* iv, 489 (*nec Jacquem.*).—P. Hookeriana *Aitch., Jour. Linn. Soc.* xviii (1880), 84 (*nec Wall.*).

In HIMALAYA occidentali:—circa Gombour, *Jacquemont;* in valle fl. Chenab superioris, 12,000 p. s. m., *Baden-Powell!* apud Sanch, 14,000 p. s. m., *Ellis!* Gilgit, 11—13,000 p. s. m., *Giles!* In Afghanistan; apud Shendtoi in paludosis, *Aitchison* 769!

DISTRIB.—Persia.

Caulibus 2—35 cm. altis; foliorum petiolis 2—4 cm. segmentis 2—12 mm.; pedicellis 5—9 mm., calyce 9—11 mm., corollæ tubo VAR. *typicæ* 30—70 mm. VAR. *brevitubæ* 18—28 mm. galeæ parte basali 2 × 4 mm. parte antherigera 4 × 2·5 mm. rostro 7 mm. longo labio 16—20 mm. lato; capsula 18 mm. longa 6 mm. lata basi rotundata, seminibus 2 mm. Maio—Septembre floret.

PLATE 2. A—C; figs. 1—14.—Pedicularis siphonantha *Don.*

A—Specimen of VAR. *typica* from Na-tong, Sikkim.
B— ,, ,, ,, from Tehri-Garhwal.
C— ,, ,, *brevituba* from Upper Chenab Valley.

This account of *P. siphonantha* is based on the examination of 117 separate specimens of VAR. *typica* and of 13 separate specimens of VAR. *brevituba*. Analyses of flowers from specimens of 71 different gatherings have been made.

The corolla tube in this widely distributed species elongates gradually as it extends from west to east; in Afghan specimens it is 18 mm. long, in Kashmir ones 30 mm., in Garhwal specimens 40 mm., in Nepalese 50 mm., in East Himalayan sometimes as much as 70 mm. long. The colour of the corolla varies somewhat; besides the many gatherings where no field-note has been made, there are at Calcutta 35 in which the corolla is said to be pink, 9 where it is noted as being rose-pink, 4 where it is noted as being deep purple; of one gathered at Yeum-tong Mr. Pantling has noted that the hood and beak are deep purple, the lip and tube pale pink; Dungboo, one of Dr. King's Lepcha collectors, has carefully noted on 3 specimens obtained by him on the same day at Choon-gu that one has a purple, another a pink, the third a white, corolla; of another gathering from Chumbi Valley the same collector notes the corolla as being pink outside and white within. Jacquemont has noted of VAR. *brevituba* "corolla albo-punctata;" more recently Dr. Aitchison has noted of the same variety on a gathering from Shendtoi, Afghanistan, "flowers cherry-coloured with splashes of white."

Of VAR. *typica* there are two distinct forms easily separated by habit and leaves:—

(*α*) "vera" = *P. siphonantha* Don. Prodr.; dwarf densely tufted with short decumbent stems or stemless and with leaf segments nearly contiguous, the more usual form in the Central and Eastern Himalaya; and

(*β*) "Hookeriana-himalayca" = *P. Hookeriana* Wall. and also = *P. himalayca* Klotzsch; tall ascending or erect (up to 35 cm. high) with leaf segments distant and subalternate, the more usual form in the Western Himalaya though not uncommon in the Eastern Himalaya also, more especially in Chumbi and in Phari. Western dwarf forms have the corolla tube as short as it is in tall specimens from the same districts; Eastern tall forms have the long corolla tube characteristic of the genuine dwarf Nepal and Sikkim plant. Finally, several gatherings from Lahul, Pangi, and Tehri have ovate leaf segments, and thus simulate VAR. *brevituba*; from that variety their longer corolla tube, more densely hirsute anterior filaments and more acutely-toothed galea throat alone distinguish them.

Of VAR. *brevituba* there are also two distinct forms:—

(*γ*) "Elephas" = *P. Elephas* Boiss., Diagn., but only partly of *Benth.*, *DC. Prodr.* and only partly of *Boiss.*, *Flor. Orient.*; with short stems and contiguous imbricate leaf segments, a Persian plant of which every character as given in the author's careful description belongs to *P. siphonantha* except that he describes the filaments as glabrous—a point wherein he is in error as regards an Afghan plant that he has referred to his own species; and

(*δ*) "punctata" = *P. punctata* Dcne., also = *P. labellata* Boiss. but not of Jacquem., and = *P. Hookeriana* Aitchison but not of Wall.; tall erect with distant alternate leaf segments, confined to the Panjab Himalaya and Trans-Indus districts.

Of Indian species VAR. *typica* repeats the habit and foliage of the various forms of *P. longiflora*, VAR. *brevituba* those of the different varieties of *P. rhinanthoides*.

4. Pedicularis bicornuta *Klotzsch* (1862).

Elata pubescens rhizomate incrassato radicibus fusiformibus carnosis caule erecto stricto incrassato foliis petiolatis lanceolatis pinnatifidis caulinis inferioribus demum emarcidis

floralibus multo majoribus segmentis 10—30-jugis oblongis obtusis crenatis floribus axillaribus pedicellatis racemis centrifugis sæpissime condensatis calycis globosi inter costas hirsutas reticulati antice ad medium fissi 5-dentati segmentis supparibus lanceolatis vel ovatis margine serratis corollæ tubo extus puberulo calycem dimidio duplove excedente labio 3-partito lobis lateraiibus rotundatis medio oblongo duplo majoribus galea subinflata circinnata parte basali fauce tensa dorso bistorta parte antherigera falcata in rostrum prælongum profunde bifidum segmentis lanceolatis sensim abeunti staminibus apice tubi insertis filamentis glabris margine undulatis ovario lanceolato stigmate exserto capsula calyce dimidio longiore ovato-lanceolata apice acuta seminibus majusculis profunde reticulatis.—P. bicornuta *Klotzsch, Reis. Pr. Wald., Bot.* 109, *t.* 61; *Hook. f., Flor. Brit. Ind.* iv, 312.—P. eximia *Watt, Jour. Linn. Soc.* xviii (1881), 381, *t.* 13.

In Himalaya occidentali:—Kashmir; in Pyr Panjal, *Falconer! Royle! Bellew! Sedgwick! Sartorius!* Alimalikimat, *Falconer!* apud Kamri, 11—13,000 p. s. m., *Giles!* Lahul, 10—15,000 p. s. m., *Brandis! Watt!* in valle Bhaga, 9,500—13,000 p. s. m.; apud Sungnum in Spiti, 11,500—12,000 p. s. m.; prope Trantse Sundo in Karnag, 14—17,000 p. s. m.; prope Puddum, 12,000 p. s. m. et apud Rangdam Goupa in Zanskar, 12—14,000 p. s. m., *Stoliczka!* Pangi, 11—16,500 p. s. m., *Heyde!* in jugo Sanch, 14,000 p. s. m., *Ellis!* Kunawar, *Hoffmeister;* Garhwal, in valle Nila, 10—11,000 p. s. m.; Tehri, apud Rudughera, 11—12,000 p. s. m. et in valle Damdar, 10—11,000 p. s. m., *Duthie!* Gilgit; Sai, 11—13,000 p. s. m., *Tanner!* Badakshan; Ishkitoul, 9,000 p. s. m., *Giles!* Afghanistan; in vallibus Kurram et Hariab in declivis graminosis, 10—12,000 p. s. m. et apud Shendtoi, in pratis, 10—11,000 p. s. m., *Aitchison!* Junio-Augusto floret, corolla concolor lutea.

Caulibus 6–40 cm. altis cygni pennæ crassitudine, rhizomatibus usque ad 10 c.m. longis; foliorum petiolis 4—6 cm., laminis 8—10 cm. longis 2 cm. latis segmentis 5—8 mm.; pedicellis 3—6 mm., calyce 15—18 mm., corollæ tubo 18—28 mm. galeæ parte basali 2·5 mm. longa 2 mm. lata parte antherigera 6 × 3 mm. rostro 9—11 mm. labio 27—30 mm. lato; capsula 25—30 mm. longa 10 mm. lata basi rotundata, seminibus 2·5 mm. longis.

Plate 3. A, B; figs. 1—14.—Pedicularis bicornuta *Klotzsch.*

A, figs. 1—11.—Specimen from Pangi.

B, figs. 12—14.— ,, ,, Kurram Valley, Afghanistan.

This account of *P. bicornuta* is based on an examination of 62 separate specimens, and on the analysis of flowers from specimens of 29 different gatherings.

The nearest ally of the species is *P. elephantoides.* The diagnosis is as follows:—

corolla throat contorted, beak deeply 2-fid	*P. bicornuta;*
corolla throat not contorted, beak very long, entire at apex	*P. elephantoides.*

There are two distinct forms of the species—that from Garhwal and the Panjab Himalaya with elongated looser racemes, with a longer corolla tube and with smaller calyx teeth; and that from the Trans-Indus district, which has more condensed racemes, a shorter corolla tube, larger calyx teeth and a more densely leafy stem. But the peculiarly contorted corolla throat which characterises this species and makes its confusion with any other Indian species impossible is the same in both districts, so that the forms are not separable even as varieties. Extreme conditions of the more Eastern form (Duthie 237!) from Rudughera in Garhwal have very lax racemes and closely resemble *P. megalantha*, which species, however, is without the contortion of the corolla throat and has hirsute anterior filaments. The Trans-Indus form, on the other hand, repeats the habit and foliage of *P. elephantoides.*

Klotzsch's figure represents the usual Eastern form and is excellent; Watt's figure, which I have been enabled, through the kindness of its author, to compare with the original specimen of *P. eximia*, shows the calyx teeth smaller and the beak less deeply bifid than they are in the plant which the artist had before him; *P. eximia* is simply the ordinary Eastern form of the species originally described by Klotzsch.

5. Pedicularis elephantoides *Benth.* (1835).

Elata pubescens caule erecto stricto incrassato foliis petiolatis oblongis pinnatifidis caulinis inferioribus demum emarcidis floralibus majoribus segmentis 6—12-jugis oblongis obtusis crenatis floribus axillaribus pedicellatis racemis centrifugis condensatis vel basi interruptis calycis globosi inter costas dense reticulati antice ad medium fissi 5-dentati segmentis late lanceolatis duplicato-serratis postico reliquis duplo minore corollæ tubo calycem dimidio excedente labio tripartito lobis lateralibus rotundatis medio oblongo duplo majoribus galea subinflata circinnata parte basali tubo dimidio latiore erecta fauce integra parte antherigera falcata in rostrum rectiusculum porrectum a basi tenue apice resupinato integrum abeunti staminibus apice tubi insertis filamentis glabris margine undulatis ovario lanceolato stigmate subexserto capsula calyce triente longiore ovato-lanceolata apice acuminata.—P. elephantoides *Benth.*, *Scroph. Ind.* 53; *Walp.*, *Rep.* iii, 413; *Benth.*, *DC. Prodr.* x, 564; *Maxim.*, *Mel. Biol.* x, 82 et xii, *t.* 1, *f.* 4; *Prain*, *Jour. As. Soc. Beng.* lviii, 2, 269.—P. rhinanthoides *Hook. f.*, *Flor. Brit. Ind.* iv, 314 (*pro parte, nec Schrenk*) (1884).

In Himalaya occidentali:—Kashmir, *Royle, Sedgwick!*

Pedicellis 3—6 mm., calyce 15—18 mm., corollæ tubo 18—25 mm. galeæ parte basali 3 mm. longa 2 mm. lata parte antherigera 6 × 3 mm. rostro 18 mm. longo labio 28 mm. lato. Radix specimini Calcuttensi deest; capsulæ mihi ignotæ descriptio ex ill. Maximowicz, *l.c.* Julio floret. Corollam luteam concolorem in speciminibus Roylei invenit Maximowicz; in specimine Calcuttensi tubum labioque luteum galeam rostroque purpuream video.

Plate 3. C; figs. 15—21.—Pedicularis elephantoides *Benth.*

Specimen from Kashmir collected by Major Sedgwick, R.E.

This account of *P. elephantoides* is based on Bentham's very brief diagnosis, on the excellent description and figure by Maximowicz *ll. cc.*, and on the examination of two flowering specimens collected in Kashmir in 1885. The species is very closely allied to *P. bicornuta*, of which it repeats the foliar leaves, calyx, corolla tube and lip, as well as the glabrous stamens with very characteristic undulate margins. It differs, however, in the uncontorted corolla throat and in the much longer and quite undivided beak. In his figure of Royle's plant Maximowicz shows the midlobe of lip truncate and the anterior filaments sparingly hirsute. These characters are not present in Sedgwick's specimens. The species appears to be rare, for no specimens were received either at Saharanpur or at Calcutta from the time of its collection by Royle till Sedgwick met with it in 1885. It is just possible that it may be a hybrid, *P. bicornuta* × *megalantha*.

6. Pedicularis megalantha *Don* (1825).

Elata (rarissime nana) erecta vel ascendens pubescens vel glabrata caulibus simplicibus vel ramosis radice centrali elongato fusiformi collo radicibus brevibus cæspitosis fibrosis

cincto foliis glabris vel nervis subtus pubescentibus petiolatis ovatis acutis pinnatipartitis segmentis 7—12-jugis oblongo-ovatis crenato-dentatis floribus axillaribus pedicellatis calycis hirsuti oblongi antice vix triente fissi 5-dentati segmento summo subintegro parvo vel 0 reliquis (nonnunquam conjunctis) ovatis crenato-dentatis corollæ tubo calycem 2—4-plo superante labio 3-fido lobis lateralibus irregulariter rotundatis medio rhomboideo vel subligulato 2—4-plo latiore galea labio incumbente et hoc obtecta angulo recto incurva parte basali subreflexa parte antherigera horizontali rostro circinnato a basi tenui apice bifido segmentis brevissimis obtusis staminibus apice tubi insertis filamentis anticis hirsutis ovario lanceolato stigmate incluso capsula calyce fere duplo longiore ovato-lanceolata apice acuta seminibus ovoideis pallidis distincte reticulatis.

VAR. *typica;* stricta racemis densis multifloris demum elongatis corollæ tubo calycem 2—3-plo superante labio lobo medio rhomboideo lateralibus duplo minore.—P. megalantha *Don, Prodr. Flor. Nepal.* 94; *Wall., Cat.* 411; *Benth., Scroph. Ind.* 53; *Walp., Rep.* iii, 413; *Benth., DC. Prodr.* x, 564; *Regel Gartenfl., t.* 943; *Hook. f., Flor. Brit. Ind.* iv, 312; *Maxim., Mel. Biol.* xii, 793; *Prain, Jour. As. Soc. Beng.* lviii, 2, 269.—P. Hoffmeisteri *Klotzsch, Reis. Pr. Wald, Bot.*, 108, *t.* 60 (1862).

In HIMALAYA occidentali:—Zirkotal, *Falconer*, 796! Chur, *Royle!* Pangi, *Stoliczka!* Chenie, *Stewart!* Kullu et Sangka, 8,500 p. s. m., *Brandis!* Deoban, 7—8,000 p. s. m., *Duthie* 202! Inhal, 9,000 p. s. m., *Schlich!* Nagkanda, 9—10,000 p. s. m., *Watt!* Kamaon, *Wallich! Royle!* Garhwal, *King!* Kathi, 7,000 p. s. m., *Collett!* Kunawar, *Hoffmeister!* Shinkota, 7—8,000 p. s. m.; Kutti in Byaus, 12—13,000 p. s. m. et Nabbi in valle Kutti, 11,000 p. s. m., *Duthie!* Nepal centrali: *Wallich! Scully!* In Himalaya orientali:—Sikkim, *Hooker;* Tongloo, *Thomson!* Mon Lepcha, 10—13,000 p. s. m., *Anderson!* Ta-lim-sam-dong, 12,000 p. s. m.; Llasha, 12,000 p. s. m., *Kingii mercenar.!* Jongri, 13,000 p. s. m., *Clarke! Kingii mercenar.!* Nepal orientali:—Domkerka, 12,000 p. s. m. et Bijan, 11,000, *Kingii mercenar.!* Bootan: apud Rishi-la, *Elwes!* Chumbi: Yao-so; Punka-be-se-mo; Koo-ma-pya et Loo-ma poo, *Kingii mercenar.!*

VAR. *pauciflora;* diffuse ramosa racemis subtrifloris corollæ tubo calycem 3—4-plo superante labio lobo medio prominente subligulato lateralibus truncatis 4-plo angustiore.—P. megalantha VAR. pauciflora *Prain in Maxim. Mel. Biol.* xii, 793 et *Jour. As. Soc. Beng.* lviii, 2, 269.

In HIMALAYA orientali:—Jongri; apud Bloktan 12,000 p. s. m.; Kankerteng, 13,000 p. s. m. et Bijan, 11,000 p. s. m., *Kingii mercenar.!* Phari; *Kingii mercenar.!*

Caulibus 6—45 cm. altis nonnunquam minimi digiti crassitudine, radice centrali 3—7 cm. longo fusiformi tenuiore; foliorum petiolis 4—6 cm. longis laminis 5—7 cm. longis 2—3·5 cm. latis segmentis saltem cauli propioribus 5—7 mm. contiguis; pedicellis 5—12 mm. longis, calyce 15—22 mm., corollæ tubo VAR. *typicæ* in speciminibus occidentalibus 30—50 mm. in speciminibus orientalibus 40—60 mm. VAR. *pauciflorœ* 70—90 mm. longis, galeæ parte basali 2 mm. longa, 3 mm. lata parte antherigera 4 mm. longa, 3 mm. lata, rostro 12—14 mm. longo labio 25—35 mm. lato; capsula 30 mm. longa 9 mm. lata basi rotundato-oblonga, seminibus 3·5 mm. longis. Floret Julio—Septembre.

PLATE 4. A—C; figs. 1—15.—Pedicularis megalantha, *Don.*

A—Specimen of VAR. *typica* ("vera") from Chumbi.
B— „ „ „ (forma "Hoffmeisteri") from Kamaon.
C—Part of specimen of VAR. *pauciflora* from Bloktan, near Jongri.
Fig. 9 is incorrect, and should be neglected.

This account of *P. megalantha* is based on the examination of 101 separate specimens of VAR. *typica* and 13 separate specimens of VAR. *pauciflora*. Analyses of flowers from 33 different gatherings of VAR. *typica* and from 4 gatherings of VAR. *pauciflora* have been made. This species appears to be truly annual. The corolla varies in colour; in all Western Himalayan specimens it is pale yellow; Don speaks (*l.c.*) doubtfully, but probably correctly, of the lip in Nepalese specimens as being yellowish-red, the rest of the corolla being purple; Hooker describes the corolla in Sikkim specimens as rose-purple. King's native collectors note the Pun-ka-be-see-mo and the Lu-ma-poo gatherings as having pale pink corollas; the other Chumbi specimens, and all the specimens of VAR. *pauciflora*, have dark purple corollas, those of the latter having dyed the drying paper in which they were received at Calcutta

Dr. Garcke of Berlin has very kindly sent to Calcutta authentic specimens of *P. Hoffmeisteri* Klotzsch, which is reduced in the *Flora of British India* to *P. siphonantha*: they show, as Mr. Maximowicz had already suggested (*Mel. Biol.* x, 82, *footnote* 8), that Klotzsch's species is a form of *P. megalantha* VAR. *typica*.

7. Pedicularis Perrottetii *Benth.* (1846).

Humilis parce pilosa rhizomate tenui lignoso serpente radicibus fibrosis caule gracili decumbente folioso ramoso foliis petiolatis profunde pinnatipartitis rhachi alatis segmentis 6—9-jugis oblongis obtusis pinnatifidis laciniis rotundatis denticulatis floribus paucis breve pedicellatis axillaribus remotis calycis tubulato-cylindrici costis parce pilosi antice parum fissi 5-dentati segmentis cristatis postico anticis dimidio lateralibus duplo minoribus corollæ tubo extus puberulo longissimo fere prorsus angustato fauce ipsa tamen subito parum ampliato calycem triplo superante labio 3-lobo galea dimidio longiore lobis lateralibus ovatis medium obovato-cuneatum spathulatum duplo excedentibus galea erecta naviculari antice subadunca parte basali tubo fere triplo latiore in partem antherigeram erostrem sensim acuminatam producta staminibus medio inter summum ovarium et tubi apicem insertis filamentis glaberrimis axibus antherarum ad perpendiculum directis ovario lanceolato stigmate exserto—P. Perrottetii *Benth.*, *DC. Prodr.* x, 565; *Wight*, *Icones t.* 1418; *Hook. f.*, *Flor. Brit. Ind.* iv, 317; *Maxim.*, *Mel. Biol.* xii, *t.* 1, *f.* 1.

In INDIA AUSTRALI:—in montibus Kundah, *Perrottet, Jerdon!*

Caule 9 cm. alto, rhizomate 4 cm. longo; petiolis 0·5—1 cm. longis laminis 2—3 cm. longis his 0·5—1 cm. latis segmentis 5—8 mm. longis 3 mm. latis; pedicellis 3—6 mm. longis, calyce 30 mm. longo 4·5 mm. lato, corollæ tubo 90—100 mm. longo 2·5 mm. lato fauce 8 mm. lato galeæ parte basali 9 mm. longa hac 6·5 mm. lata, parte antherigera 5 mm. longa, labio 24 mm. longo hoc 22 mm. lato; corolla alba.

PLATE 8. B; figs. 8—11.—Pedicularis Perrottetii *Benth.*

Specimen from S. India, distributed from Kew; *Herb. Wight*, n. 2402.

The species is unlike all other SIPHONANTHÆ in its beakless corolla; it is most nearly allied to *P. macrosiphon* Franch. and *P. muscicola* Maxim.

8. **Pedicularis bella** *Hook. f.* (1884).

Nana cæspitosa canescens radicibus fibrosis cauliculis subnullis foliis fere omnibus radicalibus petiolatis ovato-lanceolatis obtusis pinnatilobis segmentis contiguis rotundatis obtusis crenatis floribus axillaribus pedicellatis in cauliculo 1—14 calycis cylindrico-campanulati dense canescentis antice triente fissi 5-dentati segmentis lateralibus e basi angusta suborbiculatis postico lanceolato dimidio majoribus corollæ tubo extus puberulo calycem plus duplo excedente labio antice 3-lobo lobis lateralibus oblique ovalibus medio ovato 4-plo latioribus galea vix inflata angulo recto curvata parte basali abrupte reflexa parte antherigera parum inclinata angustiore longioreque leviter falcata in rostrum tenue apice emarginatum obtusum recurvum sensim attenuata staminibus apice tubi insertis filamentis omnibus barbatis ovario anguste ovato stigmate subexserto capsula oblique oblonga breve cuspidata calycem dimidio excedente seminibus pallidis distincte reticulatis.—P. bella *Hook. f.*, *Flor. Brit. Ind.* iv, 313; *Maxim.*, *Mel. Biol.* xii, 787, *t.* 1, *f.* 3.

In HIMALAYA orientali:—Sikkim; ad Kongra Lama, 16,000 p. s. m., *Hooker;* apud Ling-tu, *Pantling!* Chumbi; in Chum-la-ree prope nives et ad Sy-am-poo, *Kingii mercenar.!* Phari; apud Do-tho, *Kingii mercenar.* (ter)! Corolla saturate purpurea; floret Junio, Julio.

Cauliculis 0—3 cm. altis, radice centrali pennæ corvinæ crassitudine 3—5 cm. longo; petiolis 0·5—2 cm. basi vaginato-dilatatis laminis 1—1·5 × 0·75 cm. segmentis vix 1 mm.; pedicellis 3—7 mm., calyce 12—15 mm. × 5 mm., corollæ tubo 28—34 mm. galeæ parte basali 3 × 2·5 mm. parte antherigera 10 × 2·5 mm. rostro 8·5 mm. longo, labio 20—24 mm. lato.

PLATE 5. B; figs. 8—15.—Pedicularis bella *Hook. f.*

Specimen from Chum-la-ree, near the snows.

This account of *P. bella* is based on an examination of five different gatherings (25 specimens) of the species at Calcutta. Dr. King's collectors have not brought fruiting specimens; the description of capsule and seeds is from the *Flora of British India.* The species is most nearly allied to *P. Przewalskii* Maxim.

9. **Pedicularis Przewalskii** *Maxim.* (1877).

Nana cæspitosa pilosa rhizomate brevi radicibus cæspitosis carnosis fusiformibus cauliculis subnullis foliis fere omnibus radicalibus petiolatis anguste oblongis obtusis pinnatilobis lobis 9—13-jugis contiguis rotundatis obtusis crenatis floribus axillaribus pedicellatis in cauliculo 2—3 calycis cylindrico-campanulati antice triente fissi 5-dentati segmento summo subintegro anticis dimidio lateralibus duplo minore reliquis ovatis crenulato-dentatis corollæ tubo extus puberulo calycem triplo excedente labio 3-secto lobis supparibus medio emarginato rotundato lateralibus ovatis galea subinflata angulo recto incurva parte basali erecta tubo æquilata parte antherigera incurva in rostrum rectum horizontale apice segmentis acutis bifidum sensim attenuata staminibus apice tubi insertis filamentis omnibus hirsutis ovario lanceolato stigmate incluso capsula oblique oblonga breve cuspidata calycem fere duplo superante.—P. Przewalskii *Maxim.*, *Mel. Biol.* x., 84 et xii, 787, *t.* 1, *f.* 2; *Prain*, *Jour. As. Soc. Beng.* lviii, 2, 270.

In HIMALAYA orientali:—Phari, *Kingii mercenar.!*

Distrib.—In Chinæ prov. Kansu et Sze-tschuan; in Tibet boreali.

Cauliculis 0—3·5 cm. altis, rhizomate 0·5—1 × 0·5 cm., radicibus 2—3 cm; petiolis 1—1·5 cm., laminis 1·5—2·5 cm. × 0·5 cm. segmentis vix 2 mm.; pedicellis 4—9 mm., calyce 12—14 × 5 mm., corollæ tubo 30—35 mm., galeæ parte basali 7 × 2·5 mm., parte antherigera 5 × 3·5 mm., rostro 6 mm. longo labio 18—20 mm. lato. Capsulæ descriptio ex *Maxim. l.c.* x, 84; specimina fructigera non vidi. Flores pulchre rosei.

Plate 5. C; figs. 16—21.—Pedicularis Przewalskii *Maxim.*

Specimen from Phari.

This description is founded on an examination of 12 specimens—2 from Sze-tschuan, collected by Potanin; 4 from Kansu, collected by Przewalskii; and 6 from Phari, obtained by one of Dr. King's native collectors.

The Phari specimens are very poor and, till Mr. Maximowicz kindly sent to Calcutta the excellent suite of Chinese specimens, could not be disposed of, but were placed tentatively beside *P. asplenifolia* var. *pubescens* (now *P. Dalloni*). From *P. Dalloni*, however, *P. Przewalskii* is very distinct, the diagnosis between the species being as follows:—

corolla tube uniform externally densely pubescent, lobes of lip subequal, basal portion of gradually-beaked galea erect beak horizontal, filaments inserted at apex of tube . . . . . *P. Przewalskii*;

corolla tube expanded at top glabrescent relatively shorter, mid-lobe of lip smallest, base of abruptly-beaked galea reflexed beak declinate, filaments inserted below apex of tube . . . . . *P. Dalloni.*

The corolla of the Phari specimens agrees exactly with that of the Chinese ones, but the calyx is shorter and is subinflated. As regards calyx the Chinese specimens of *P. Przewalskii* more closely resemble *P. Daltoni* than the specimens from Phari do.

10. **Pedicularis Daltoni** *Prain* (1889).

Nana dense pubescens rhizomate horizontali collo pluricipite maximo radicibus longissimis caulibus brevibus erectis foliis petiolatis linearibus pinnatifidis segmentis 12—20-jugis contiguis ovatis mucronato-dentatis floribus axillaribus longissime pedicellatis racemis densifloris calycis cylindrico-campanulati dense pubescentis antice triente fissi 5-dentati segmentis ellipticis serratis postico anticis dimidio lateralibus duplo minore corollæ tubo extus leviter puberulo calyce dimidio longiore sursum ampliato labio 3-fido lobis rotundatis margine crenulatis lateralibus medio dimidio latioribus galea inflata arcuate incurva parte basali leviter reflexa tubo æquilata parte antherigera abrupte incurva in rostrum rectum leviter deorsum directum apice segmentis acutis bifidum abruptius attenuata staminibus medio inter summum ovarium et apicem tubi insertis filamentis omnibus hirsutis ovario superante seminibus ovoideis pallidis distincte reticulatis.—P. Daltoni *Prain, Jour. As. Soc. Beng.* lviii, 2, 270.—P. asplenifolia var. pubescens *Hook. f., Flor. Brit. Ind.* iv, 315 (1884). Pedicularis n. 20, *Herb. Ind. Or. H. f.* & *T. T.*

In Himalaya orientali:—Sikkim; ad Don-kia-la, 14,000 p. s. m., *Hooker! Kingii mercenar.!* ad Ze-lep-la, *Kingii mercenar.!* Chumbi; ad Perm-la prope Chum-la-ree, in Chum-la-ree ad nives et apud Ka-poop, *Kingii mercenar.!* Phari:—*Kingii mercenar.!* Julio-Augusto floret; corolla rosea.

Caulibus, e collo singulo 2—20, 2—6 cm. altis, rhizomate 4—10 cm. longo hoc 1—2 cm. crasso radicibus usque ad 15 cm. longis; petiolis 2—4 cm. basi sæpius vaginato-dilatatis laminis 2·5—4 × 0·5 cm. segmentis vix 2 mm.; pedicellis 25—60 mm., calyce 10—12 × 5 mm., corollæ tubo 16 mm. galeæ parte basali 5 × 2 mm. parte antherigera 6·5 × 3·5 mm. rostro 5 mm. longo labio 18—20 mm. lato; capsula 20 × 6 mm. seminibus 1·75 mm. longis.

Plate 6. A, B; figs. 1—6.—Pedicularis Daltoni *Prain*.

A—Specimen from Chum-la-ree, near the snows.
B— „ „ Donkia-la, 17,000.

This description is based on the examination and analyses of flowers from 47 specimens. The species stands almost exactly intermediate between *P. Przewalskii* and *P. Garckeana*. The diagnosis from *P. Przewalskii* has been already given: the diagnosis from *P. Garckeana* is as follows:—

galea base reflexed, thin, inflated, abruptly beaked beak straight; mid-lobe of lip rounded; all filaments equally hairy, stamens inserted distinctly below apex of tube . . . . . *P. Daltoni;*

galea base erect, not inflated, gradually beaked beak circinnate; mid-lobe of lip cuneate, projecting; posterior filaments very sparingly hirsute, stamens inserted near apex of tube . . . . . *P. Garckeana.*

The deeply 2-fid beak at once distinguishes the species from *P. asplenifolia* and its allies.

11. **Pedicularis Garckeana** *Prain* (1888).

Elata hirsuta rhizomate breviore radicibus carnosis fusiformibus caulibus gracilibus erectis polyphyllis foliis petiolatis linearibus pinnatifidis segmentis 12—20-jugis contiguis ovatis mucronato-dentatis floribus axillaribus longe pedicellatis racemis densifloris calycis cylindrico-campanulati hirsuti antice triente fissi 5-dentati segmentis ellipticis cristatis postico reliquis dimidio angustiore corollæ tubo extus leviter puberulo calyce plus dimidio longiore labio 3-fido lobis lateralibus ovatis medio oblongo parum prominente truncato dimidio latioribus galea inflata circinnata parte basali erecta tubo æquilata parte antherigera falcata in rostrum gracile apice segmentis acutis bifido circulum formans sensim producta staminibus medio inter summum ovarium et apicem tubi insertis filamentis anticis dense posticis parcius hirsutis ovario lanceolato stigmate incluso capsula oblique oblonga breve cuspidata calycem dimidio superante.—P. Garckeana *Prain in Maxim.*, *Mel. Biol.* xii, 788; *Jour. As. Soc. Beng.* lviii, 2, 267.

In Himalaya orientali:—Chumbi; ad Na-toot, ad Tan-ka-la, apud Be-ong-chin prope Chumbi, apud Loo-ma-poo, ad Bootang et ad Pun-ka-bee-see-mo, *Kingii mercenar.!* Corolla varie rosea, punicea vel albo-rosea notatur; Julio floret.

Caulibus 6—16 cm. altis, rhizomate 1—2 × 0·5 cm., radicibus 5—6 cm.; petiolis 2—3 cm. vaginato-dilatatis laminis 3·5—6 × 0·5 cm., segmentis 2 mm.; pedicellis 8—18 mm., calyce 14—16 × 6 mm., corollæ tubo 22—30 mm., galeæ parte basali 4 × 2 mm. parte antherigera 7 × 3·5 mm. rostro 7·5 mm. longo, labio 18—20 mm. lato; capsula 22 mm. longa.

PLATE 5. A; figs. 1—7.—Pedicularis Garckeana *Prain.*

A—Specimen from Tan-ka-la, Sikkim.
Fig. 7—Part of specimen from Na-toot, Sikkim.

The description of *P. Garckeana* is based on the examination of 57 specimens; two or more flowers from specimens of each gathering have been analysed. The shorter specimens very closely resemble taller ones of *P. Daltoni* on the one hand and of *P. robusta* on the other; between these two species this stands intermediate in many respects. At the same time by the taller habit of many of its specimens, by the longer and narrower cuneate mid-lobe of lip, and by the posterior filaments being distinctly less hirsute than the anterior, it approaches *P. megalantha*, certain forms of which it sometimes closely resembles. The diagnosis from *P. Daltoni* has been given; from *P. robusta* it is diagnosed as follows:—

mid-lobe of lip cuneate; galea erect, not inflated; beak circinnate, long; posterior filaments sparingly hairy . . . . . *P. Garckeana;*
mid-lobe of lip rounded; galea reflexed, inflated; beak straight, short; all filaments equally hairy . . . . . *P. robusta;*

while from *P. megalantha* the diagnosis is—

tube short, half exceeding calyx; galea erect, beak deeply 2-fid, segments acute; posterior filaments sparingly hairy . . . . . *P. Garckeana;*
tube much exceeding calyx; galea reflexed, beak shortly 2-fid, segments obtuse; posterior filaments quite glabrous . . . . . *P. megalantha.*

12. Pedicularis robusta *Hook. f.* (1884).

Nana dense pubescens rhizomate horizontali radicibus longioribus caulibus brevibus arcuatis ascendentibus foliis anguste oblongis obtusis pinnatilobis segmentis 8—10-jugis contiguis ovatis obtusis crenatis floribus axillaribus pedicellatis racemis densifloris calycis cylindrico-campanulati pubescentis antice triente fissi 5-dentati segmentis supparibus oblongis obtusis serratis corollæ tubo extus glabro calycem haud excedente labio 3-lobo lobis rotundatis subæqualatis medio prominulo galea perinflata angulo obtuso incurva parte basali recta parte antherigera leviter falcata in rostrum breve apice segmentis acutis bifidum statim deorsum directum sensim producta staminibus medio tubo insertis filamentis omnibus barbatis ovario lanceolato stigmate incluso capsula oblique oblonga breve cuspidata calycem fere duplo superante, seminibus ovoideis pallidis immaturis distincte reticulatis (maturis, teste cl. *Hookero*, subtiliter striatis nec punctulatis).—P. robusta *Hook. f.*, *Flor. Brit. Ind.* iv, 306.

In HIMALAYA orientali:—Sikkim; Samdong, 16,000 p. s. m., *Hooker; Elwes! Kingii mercenar.!* Phari:—*Kingii mercenar.!*

Caulibus 2—6 cm. altis, rhizomate 2—4 cm. longo hoc 0·5—1 cm. crasso, radicibus 4—7 cm. longis; petiolis 1—2 cm., laminis 2—3 × 0·5 cm., segmentis vix 2 mm.; pedicellis 4—9 mm., calyce 10 × 4·5 mm., corollæ tubo 9 mm., galeæ parte basali 4 × 2·5 mm., parte antherigera 8 × 4 mm., rostro 4 mm. longo, labio 15—16 mm. lato; capsula 18 × 5 mm., seminibus 1·5 mm. longis. Corolla purpurea; Septembre floret.

PLATE 6. C, D; figs. 7—13.—Pedicularis robusta *Hook. f.*

C—Specimen collected in Alpine Sikkim by Captain Elwes.
D— „ from Phari collected by the Lama Ujyen Gyatsko.

The description of *P. robusta* is based on the examination of only three specimens, two of which are now figured. The species stands intermediate between *P. Garckeana* and *P. nepalensis*. The diagnosis from *P. Garckeana* has been already given; that from *P. nepalensis* is as follows:—

mid-lobe of lip prominent, margin entire; tube not exceeding calyx, externally glabrescent; capsule half exceeding calyx . . . . . *P. robusta;*
mid-lobe not prominent, margin crenulate, lobes truncate; tube twice as long as calyx, puberulous without; capsule twice as long as calyx . . . . . *P. nepalensis.*

Though the corollas somewhat closely resemble those of *P. nepalensis*, the latter is easily distinguished by its few, axillary, long-pedicelled flowers and its very short stems.

13. Pedicularis nepalensis *Prain* (1889).

Nana cæspitosa glaberrima rhizomate brevi radicibus cæspitosis carnosis fusiformibus cauliculis subnullis foliis fere omnibus radicalibus longe petiolatis linearibus pinnatifidis segmentis 8—12-jugis contiguis ovatis mucronato-dentatis floribus axillaribus longe pedicellatis in cauliculo 3—6 calycis cylindrico-campanulati costis parce hirsuti antice triente fissi 5-dentati segmentis ellipticis serratis postico reliquis parum angustiore corollæ tubo extus parce puberulo calyce fere duplo longiore labio 3-lobo margine crenulato-serrato lobis truncatis lateralibus ovatis medio rotundato duplo majoribus galea perinflata angulo subrecto incurva parte basali leviter reflexa parte antherigera falcata in rostrum breve apice segmentis acutis bifidum deorsum directum abruptius attenuata staminibus medio inter summum ovarium et apicem tubi insertis filamentis omnibus barbatis ovario lanceolato stigmate incluso capsula oblique oblonga breve cuspidata calycem fere 2-plo longiore seminibus late ovatis pallidis distincte reticulatis.—P. nepalensis *Prain, Jour. As. Soc. Beng.* lviii, 2, 268.

In HIMALAYA orientali:—In Nepaliâ orientali, ad Ka-gling, 13,000 p. s. m., *Kingii mercenar.!* Sikkim; apud Choon-goo, *Kingii mercenar.!* Corolla saturate purpurea; Augusto floret.

Cauliculis 0—1 cm. altis, rhizomate 0·5—1 × 0·5 cm., radicibus 2—3 cm.; petiolis 2—3 cm., laminis 2 cm. × 0·75 cm., segmentis 2—3 mm.; pedicellis 25—35 mm., calyce 15 × 5 mm., corollæ tubo 25—28 mm., galea parte basali 5 × 3 mm., parte antherigera 10 × 4·5 mm., rostro 4·5 mm. longo, labio 27—30 mm. lato; capsula 20 × 5 mm., seminibus 2 × 1 mm.

PLATE 6. E; figs. 14—20.—Pedicularis nepalensis *Prain.*

E—Specimen from Ka-gling, East Nepal.

This species is represented at Calcutta by one large gathering of 23 specimens from Ka-gling received in 1888 and a small one of 3 specimens from Choon-goo, received in 1882. On an examination of these the account is based. The flowers, as description and figure show, are very like those of *P. robusta*, but the habit and facies are widely different and almost repeat those of *P. Przewalskii*, between which and *P. robusta* it appears to stand intermediate.

The type of corolla of this, and more especially of *P. robusta*, in which the tube is shorter, approaches that of *P. macrantha* and its allies, where, however, the general habit is widely different. The relationship of the group to which this belongs to the *Pumiliones* is very close, for *P. Daltoni*, which is by its habit hardly distinguishable from the other three species, is by its corolla very nearly related to *P. Przewalskii*. As regards the other three species it is not improbable that ultimately they may be demonstrated to be forms of one species only. *P. nepalensis*, though differing in habit, has the same corolla tube as *P. Garckeana*, and differs chiefly in having more inflated galea, shorter, more acute beak, shorter and wider mid-lobe of lip. *P. robusta*, so far as the meagre material available shows, is in habit an abbreviated *P. Garckeana* with, however, a galea, beak, and lip more like those of *P. nepalensis* and a corolla tube different from those of both the others. The somewhat intricate relationships of these species are shown in diagram 12.

DIAGRAM 12.

Relationships of the species of the groups *Robustæ* and *Pumiliones*.

14. Pedicularis macrantha *Klotzsch* (1862).

Humilis vel elata glabra rhizomate brevissimo radicibus carnosis fusiformibus fasciculatis caule erecto stricto simplici pennæ corvinæ crassitudine oligophyllo foliis radicalibus paucis demum evanidis longe petiolatis sæpissime pinnatisectis segmentis 10—16-jugis distantibus ovato-lanceolatis pinnatipartitis laciniis argute dentatis floribus axillaribus longe pedicellatis racemis laxiusculis foliis summis floralibus ad bracteas lineares reductis calycis ovati costis pilosi antice ad medium fissi 5-dentati segmentis supparibus oblongo-lanceolatis inciso-serratis corollæ tubo sursum ampliato calycem vix æquante labio 3-lobato lobo medio orbiculato integro vel emarginato lateralibus orbiculatis aut breviore et æquilato aut æquilongo et angustiore galea inflata circinnata parte basali erecta vel leviter reflexa recta vel dextrorsum torta parte antherigera falcata in rostrum conicum circinnatum apice segmentis acutis breviter bifidum sensim vel abruptius producta

staminbus medio inter summum ovarium et tubi apicem insertis filamentis omnibus pilosis ovario ovato-lanceolato stigmate subincluso capsula oblique ovato-lanceolata apice acuminata calycem triente excedente seminibus ovoideis pallidis distincte reticulatis.

VAR. *typica;* labio lobo medio lateralibus æquilongo et manifeste angustiore galea parte basali contorta parte antheras fovente sensim in rostrum attenuata.—P. macrantha *Klotzsch*, *Reis. Pr. Wald.*, *Bot.* 108, *t.* 59; *Hook. f.*, *Flor. Brit. Ind.* iv, 311.

In HIMALAYA occidentali:—Kamaon, *Hoffmeister!* prope glaciem in valle Ralam, 13,000 p. s. m., *Duthie!* Garhwal; ad Kulhara, 11,000 p. s. m., *Strachey et Winterbottom.*

VAR. *lutescens;* labio lobo medio nec prominente lateralibus suppari galea rarissime contorto in rostrum a basi subabrupte tenuius abeunti.—P. ochroleuca *Duthie in Maxim.*, *Mel. Biol.* xii, 790, *t.* 1, *f.* 5 (*nec Schlosser*) (1888).

In HIMALAYA occidentali:—Kamaon; Darma, in valle Nipchang, 14—15,000 p. s. m.; in valle Dhauli prope Bidang, 14—15,000 p. s. m.; Byaus, ad Palang Gadh, 11—12,000 p. s. m.; et prope glaciem in Lebang, 14—15,000 p. s. m., *Duthie!* In Nepal occidentali; ex adverso pagi Budh nuncupati, 10—11,000 p. s. m. et ad Nampa Gadh, 12,000 p. s. m., *Duthie!*

Floret Julio-Septembre; corolla VAR. *typicæ* concolor rosea, VAR. *lutescentis* tubo labioque lacteo galea purpurea.

Caulibus 5—15 cm. altis, radicibus 5—8 × 0·5 cm.; petiolis 3—12 cm. basi leviter vaginato-dilatatis laminis lanceolatis 5—12 × 1—2·5 cm., rhachi dentatis (in specimine VAR. *typicæ* in valle Ralam a cl. *Duthieo* lecto rhachi late alatis), segmentis 8—12 mm.; pedicellis 5—9 mm., calyce 12—14 × 5 mm., corollæ tubo 10 mm., galea parte basali 5 × 2·5 mm. parte antherigera 7—8·5 × 3·5 mm., rostro 6 mm. longo, labio VAR. *typicæ* 25 mm. lato (lobo medio 7 mm. longo hoc 8 mm. lato) VAR. *lutescentis* 20—22 mm. lato (lobo medio 5 mm. longo hoc 8 mm. lato sæpissime rotundato sed in specimine ad glaciem Lebang a cl. *Duthieo* lecto emarginato-truncato); capsula 18 × 6 mm., seminibus 1·75 mm. longis.

PLATE 7. A—D; figs. 1—13.—Pedicularis macrantha *Klotzsch.*

A—Specimen of VAR. *typica*, part of Dr. Hoffmeister's original gathering.
B— „ „ „ from near the Ralam glacier, Kamaon.
C— „ „ *lutescens* from Bidang, in Dhauli Valley.
D—Fruiting specimen of same gathering (Herb. Saharanpur).

The characters by which the two varieties of this species are separated are not at all reliable in other species of the genus, and probably will be found untenable here when more material is available for study. The present description is based on the examination of three specimens (two gatherings) of the typical plant, one specimen being an original one which Dr. Garcke has kindly sent to Calcutta, and 17 specimens (mostly in Herb. Saharanpur) of five separate gatherings of VAR. *lutescens.*

It appears to be a local species, but Mr. Duthie informs me that it is abundant where it occurs; he tells me also that the two varieties grow side by side, and it did not occur to him in the field that they could be the same plant.

15. **Pedicularis Scullyana** *Prain* (1888).

Elata hirsuta foliosa rhizomate horizontali elongato crasso carnoso radicibus cæspitosis fusiformibus caule erecto stricto robusto foliis petiolatis lanceolatis pinnatipartitis rhachi alatis segmentis 14—20-jugis pinnatifidis laciniis paucidentatis floribus axillaribus racemo denso centrifugo approximatis pedicellatis calycis ovati costis hirsuti antice ad medium fissi 5-dentati segmentis cristato-dentatis corollæ tubo sursum ampliato extus puberulo calycem vix excedente labio 3-lobato lobis lateralibus ovatis medio orbiculato plus duplo majoribus galea perinflata angulo recto bis incurva parte basali angulo obtuso reflexo parte antherigera falcata in rostrum breve bifidum statim deorsum directum producta staminibus medio tubo insertis filamentis rufo-villosis ovario ovato-lanceolato stigmate subincluso capsula lanceolata acuta calyce duplo longiore seminibus anguste ovoideis distincte reticulatis.—P. Scullyana *Prain in Maxim., Mel. Biol.* xii, 789, *t.* 1, *f.* 6; *Jour. As. Soc. Beng.* lviii, 2, 268.

In Himalaya centrali et orientali:—Nepal; ad Gosain Than, *Wallich! Scully!* Jongri, ad Pey-kiong-la, ad Bijan, 11,000 p. s. m. et apud Domkerka, 12,000 p. s. m., *Kingii mercenar.!* Flores concolores lutei; Augusto floret.

Rhizomate 6—16 cm. longo 1—1·5 cm. lato, radicibus 5—6 mm. longis subfibrosis, caulibus 14—40 cm. altis digitique mininimi crassitudine; foliorum petiolis 3—6 cm. longis, laminis 7—16 cm. longis his 0·75—1 cm. latis in speciminibus orientalibus, 2·5—3 cm. latis in speciminibus e Gosain Than, summorum floralium mere serratis, segmentis 6—12 mm. 4—9-jugis; pedicellis 3—7 mm., calyce 18—21 mm. longo hoc 7—9 mm. lato, corollæ tubo 16—18 mm. longo basi 2·5 mm. apice 6 mm. lato, galea parte basali 5 mm. × 2·5 mm. parte antherigera 12—14 mm. × 5 mm. rostro 4 mm. longo, labio 20—25 mm. lato in speciminibus orientalibus, plus quam 30 mm. lato in speciminibus e Gosain Than; capsula 28 mm. longa hac 9 mm. lata basi antice nec tamen postice rotundata, seminibus 2·5 mm. longis.

Plate 9. A—C; figs. 1—7.—Pedicularis Scullyana *Prain*.

A—Specimen from Gossain Than, Nepal.
B— „ „ Pey-kiong-la, Jongri.
C—Fruiting specimen from Bijan, on the Sikkim-Nepal frontier.

The account of *P. Scullyana* is based on the examination of 55 specimens in flower and fruit. It is most nearly allied to *P. macrantha*, from which it differs by its much larger flowers, its smaller mid-lobe of lip and much shorter beak. This, and not *P. macrantha*, is the Nepal species sent to Calcutta by Scully. Wallich's specimens were mixed, not by Wallich himself, but by Don! with *P. megalantha;* a sheet of this, named "*P. megalantha*" by Don himself and distributed "ex herb. R. Brown," is in the Calcutta herbarium. The Jongri specimens have stouter stems than Scully's specimens, but not than Wallich's Nepal one. In both the Nepal gatherings the corolla is somewhat more abruptly beaked than it is in any of the Jongri ones.

16. **Pedicularis Elwesii** *Hook f.* (1884).

Humilis vel elata rhizomate perenni sæpissime simplici collo sæpius multicauli radicibus fusiformibus carnosis caulibus ascendentibus arcuatis pubescentibus oligophyllis

foliis radicalibus cæspitosis caulinis sparsis petiolatis lanceolatis pinnatisectis segmentis 16—35-jugis pinnatifidis laciniis serratis floribus axillaribus caulum apicibus confertis pedicellatis calycis obliqui ovati antice fere ad basin fissi 3- vel 5-dentati segmentis lateralibus sæpius conjunctis basi angusta ovatis margine serratis postico lanceolato integro vel apice serrato duplo majoribus corollæ tubo sursum ampliato calycem vix excedente labio 3-lobato lobis orbiculatis margine dense ciliatis lateralibus integris medio emarginato duplo majoribus galea subinflata angulo recto incurva parte basali angulo subrecto reflexa dextrorsumque torta parte antherigera subrecta in rostrum falcatum apice profunde segmentis subulatis bifidum sensim producta staminibus medio tubo insertis filamentis omnibus superne rufo-barbatis ovario ovato-oblongo stigmate exserto capsula ovata acuminata seminibus ovoideis pallidis striato-reticulatis basi appendiculatis antice profunde nigro-sulcatis.—P. Elwesii *Hook. f.*, *Flor. Brit. Ind.* iv, 312; *Maxim.*, *Mel. Biol.* xii, 793, *t.* 1, *f.* 8.

In Himalaya orientali:—Sikkim, in valle Lachen, 12—14,000 p. s. m., *Hooker*, *Elwes;* ad Kan-ko-la, 13,000 p. s. m., *Hooker !* ad Tschi-kook, 12,000 p. s. m., *Pantling !* Chumbi: ad Sy-am-poo, ad Perm-la prope Chum-la-ree et in Chum-la-ree ad nives, *Kingii mercenar. !* Phari: (bis) *Kingii mercenar. !* Jongri; apud Ong-la-thang infra Kin-chin-janga, 12,000 p. s. m., *Kingii mercenar. !* Julio, Augusto, et Septembre floret; corollis concoloribus saturate purpureis specimine Calcuttensi ad nives in Chum-la-ree lecto, cui flores albi adnotantur, excepto.

Distrib.—Yunnan.

Rhizomate 2—6 cm. interdum superne ramoso, radicibus 7—10 cm. longis usque ad 1 cm. crassis, caulibus 6—25 cm. altis corvique pennæ crassitudine; foliorum petiolis 3—9 cm. longis caulinorum præsertim floralium vaginato-dilatatis laminis 4—12 cm. longis his 1 cm. latis segmentis 4—5 mm. latis contiguis et interdum retro-imbricatis; pedicellis 4—9 mm., calyce 12—18 mm., corollæ tubo 11—17 mm. galeæ parte basali 3 × 2·5 mm. parte antherigera 9—10 × 3 mm., rostro 6—7 mm. longo, labio 20—25 mm. lato; capsula 15 mm. longa hac 5 mm. lata, seminibus 2·5 mm. longis.

Plate 8. A; figs. 1—7 and fig. 12.—Pedicularis Elwesii *Hook. f.*

Specimen from Phari.

This description is founded on an examination of 43 specimens from 8 gatherings.

The species is well distinguished by the very dense fringe of ciliate hairs on the margin of the lip and by the deeply-cleft calyx.

17. Pedicularis integrifolia *Hook. f.* (1884).

Humilis cæspitosa glandulose pubescens rhizomate incrassato maximo radicibus fusiformibus carnosis collo pluricauli caulibus simplicibus ascendentibus foliis anguste oblongis margine crenulatis radicalibus cæspitosis petiolatis caulinis 2—4-paribus oppositis sessilibus floribus sessilibus verticillo terminali (nonnunquam etiam in verticillo huic proximo inferiore) axillaribus calycis cylindrico-campanulati glandulose pubescentis antice triente fissi 5-dentati segmentis oblongis supparibus margine crenatis corollæ tubo calycem plus dimidio excedente labio 3-lobo lobis rotundatis subæquilatis galea inflata angulo recto incurva parte basali erecta tubo æquilata parte antherigera horizontali in rostrum tenue longissimum porrectum et demum flexuosum apice obtuso integrum abrupte abeunti staminibus apice tubi insertis filamentis omnibus barbatis ovario ovato stigmate incluso.—P. integrifolia *Hook f.*, *Flor. Brit. Ind.* iv, 308; *Maxim.*, *Mel. Biol.* xii, *t.* 2, *f.* 23.

In Himalaya orientali:—Sikkim, ad Tungu 14,000 p. s. m, *Hooker*. Phari:—(quater), *Kingii mercenar.!* [Nuperrime etiam in Yunnan a *Delavayo* detecta.]

Caulibus 4—7 cm. altis, rhizomate 2—3 cm. × 1—1·5 cm. radicibus 3—4 cm. longis, petiolis foliorum radicalium 3—5 cm. longis prorsus vaginato-dilatatis horum laminis 2—3 cm. × 0·5 cm., laminis caulinis 1·25—1·5 cm. × 0·75—1 cm. segmentis brevissimis; calyce 12 mm. longo, hcc 4·5 mm. lato, corollæ tubo 20 mm. longo galea parte basali 4 mm. × 2 mm. parte antherigera 6·5 mm., × 5 mm., rostro 15 mm. longo labio 18 mm. lato. Corolla saturate purpurea; Julio floret.

Plate 5. D; figs. 22—27.—Pedicularis integrifolia *Hcok. f.*

Specimen from Phari.

This account of *P. integrifolia* is based on an examination of 20 specimens, and on the analysis of flowers and buds from 4 gatherings. The opposite leaves indicate great affinity with the flexuose-beaked Orthorrhynchæ, the æstivation, however (fig. 27), and the staminal insertion (fig. 25), are characteristically Siphonanthous.

§§ Orthorrhynchæ Prain.

Rostro flexuoso, labio longiore:—
- filamentis omnibus hirsutis:—
  - staminibus ex adverso summi ovarii insertis basi superneque barbatis:—
    - foliis caulinis petiolatis, floribus purpureis . . . . . 18. *P. pectinata.*
    - foliis caulinis sessilibus, floribus luteis . . . . . 19. *P. tenuirostris.*
  - staminibus medio tubo insertis basi glabris superne parcius barbatis,
    - foliis caulinis petiolatis floribus purpureis . . . . . 20. *P. pyramidata.*
  - filamentis omnibus glabris . . . . . 21. *P. Oliveriana.*

Rostro porrecto, labium subæquante (in *P. Heydei* labio longiore):—
- foliis verticillatis; filamentis glabris:—
  - floribus interrupte spicatis:—
    - rostro apice 2-fido, labio 3-fido . . . . . 22. *P. brevifolia.*
    - rostro apice integro, labio 3-partito . . . . . 23. *P. instar.*
  - floribus paniculato-racemosis . . . . . 24. *P. gracilis.*
- foliis oppositis:—
  - bracteis sessilibus; filamentis glabris:—
    - labio parvulo rostro breviore, floribus interrupte spicatis . . . 25. *P. Heydei.*
    - labio rostrum æquante:—
      - floribus paucis distantibus bracteis ovatis . . . . . 26. *P. porrecta.*
      - floribus subcapitatim confertis bracteis laciniatis . . . . 27. *P. confertiflora.*
  - bracteis petiolatis:—
    - filamentis anticis hirsutis:—
      - rostro apice 2-lobo, tubo calyce longiore . . . . . 28. *P. flexuosa.*
      - rostro apice integro, tubo calycem æquante . . . . . 30. *P. tenuicaulis.*
    - filamentis omnibus glabris . . . . . 29. *P. chumbica.*

18. Pedicularis pectinata *Wall.* (1828).

Elata sparse 3—4-fariam pilosa rhizomate horizontali incrassato collo pluricipite caulibus erectis teretibus fistulosis sæpissime ramosis ramis foliisque 3—4-natim verticillatis foliis petiolatis petiolis radicalibus longissimis laminis oblongis vel oblongo-lanceolatis acutis

pinnatisectis partitisve segmentis 8—15-jugis linearibus serratis vel lanceolatis pinnatifidis serrato-dentatis floribus subsessilibus dense spicatis bracteis serrato-dentatis inferioribus lanceolatis summis ovatis acutis calycis ovati inflati glabri vel costis hirsuti 5-dentati segmentis lanceolatis acutis vel ovatis acuminatis margine integris corollæ tubo calyce æquilongo antice ad insertionem filamentorum leviter sacculato labio rotundato antice 3-lobo lobis lateralibus ovatis medio orbiculato duplo majoribus galea inflata angulo recto incurva parte basali leviter antice incurva parte antherigera horizontali in rostrum a medio tenue basi porrectum apice acuto integro circinnate deflexum sensim producta staminibus in sacculo ex adverso summi ovarii insertis filamentis basi et supra medium dense rufo-villosis ceterum glabris ovario ovato stigmate incluso capsula late ovata acuminata parum exserta seminibus majusculis ovatis testa pallidis rugosis profunde reticulatis.

VAR. *typica;* foliis sæpius pinnatisectis segmentis pinnatifidis calyce distincte inflato dentibus lanceolatis acutis.—P. pectinata *Wall.*, *Cat.* 420; *Benth.*, *Scroph. Ind.* 52; *Walp.*, *Rep.* iii, 411; *Benth.*, *DC. Prodr.* x, 560; *Hook. f.*, *Flor. Brit. Ind.* iv, 306; *Maxim.*, *Mel. Biol.* xii, 810, *t.* 2, *f.* 25.

In HIMALAYA occidentali:—Bandkote, *Falconer !* in valle Sind, 8,000 p. s. m., *Clarke !* Chor Nagkanda, *Royle !* Kamaon, *Wallich !* Laka, *Edgeworth !* Theog, 8,000 p. s. m., *Gamble !* Chor Jubal, 11,000 p. s. m., *Collett !* Simla, *Schlich !* in valle Chassak, 11,000 p. s. m., *Ellis* (1466)! Dalhousie, 7,000—8,700 p. s. m., *Clarke !* Gilgit, 8,000 p. s. m., *Tanner !* Jaunsar Bahar; in montibus Deoban, 7—8,000 p. s. m. et in jugo Kinani, 8—9,000 p. s. m., *Duthie !* Dharma; in Mulapa Gadh; Byaus in Palang Gadh, 11,000 p. s. m., prope Kutti, 13—14,000 p. s. m. et ad Chalek, 11—12,000 p. s. m.; Tehri-Garhwal, in Rudughera Gadh, 11—12,000 p. s. m.; in Lekhun Gadh infra Srikanta, 11—12,000 p. s. m. et supra Taulea, 13—14,000 p. s. m.; in valle fl. Jumna inter Oogri et Banas; ad Dumbotia Gadh, 9—10,000 p. s. m.; in valle Ralam prope glaciem, 12,000 p. s. m., *Duthie !* apud Harong, 9,000 p. s. m., *Brandis !*

VAR. *palans;* foliis pinnatipartitis segmentis linearibus calyce campanulato dentibus ovatis acuminatis.—P. pectinata VAR. pyramidata *Hook. f.*, *Flor. Brit. Ind.* iv, 306 (1884) (*syn.* P. pyramidata *exclus.*).—P. pyramidata *Herb. Ind. Or. H. f. & T. T.* (*nec Royle*).

In HIMALAYA occidentali:—Kashmir: Zircotal, *Royle !* Pyr Panjal, 11,000 p. s. m., *Clarke !* in valle Chassak, 11,000 p. s. m., cum VAR. præcedente, *Ellis* (1465)! Sanch Pass, 12,000 p. s. m., *Ellis* (1543)! in valle Ajok, 10,000 p. s. m., *Ellis* (1486)! *Him. Bor. Occid.*, 7—12,000 p. s. m., *Thomson* ("P. pyramidata," *Herb. Ind. Or.*)! Lahul, *Hay ! Jæschke* (233)! *Watt !* Dranti Pass, 12,000 p. s. m., *Baden-Powell !* Pangi, *Stolickza ! Brandis* (3158)!

Caulibus 40—100 cm. altis cygni pennæ crassitudine, rhizomate 8—12 cm. longo 0·5—1 cm. crasso, ramis 5—15 cm. longis; foliis maximis petiolis 4—12 cm. longis laminis 5—15 cm. × 2·5—5 cm. segmentis 12—20 mm. × 5 mm.; calyce 10 mm. longo hoc 5 mm. lato, corollæ tubo 10 mm. longo galeæ parte basali 4 × 3 mm. parte antherigera 5 × 3·5 mm. rostro 10 mm. longo labio 20 mm. lato; capsula 11 × 6 mm., seminibus 3 mm. longis, his 1·75 mm. latis. Julio et Augusto floret; corolla purpurea.

PLATE 23. A, B; figs. 1—11.—Pedicularis pectinata *Wall.*

A—Specimens of VAR. *typica;—right hand* from Kamaon (Wall. Cat. n. 420 in Herb. Calcutt.); *left hand* from Chor Nagkanda (Royle).
B—Specimen of VAR. *palans* from Ajok valley (Ellis; Flora of Upper Chenab, n. 1486).

This account of *P. pectinata* is based on the examination of more than one hundred flowering specimens belonging to 46 different gatherings; flowers from every individual specimen have been analysed. Plate 23A, which represents a specimen of Wallich's original plant, and B, which represents one exactly = *P. pyramidata* Herb. Ind. Or. (not of *Royle*), rather illustrate extreme forms of a variable species than distinct varieties. With this explanation they are now advanced as affording the simplest explanation of the synonymy of the group to which the species belongs.

P. pyramidata closely resembles this species, and varies equally in habit. But neither at Calcutta nor at Saharanpur, where both species are very well represented, is there a single form where the floral structure is intermediate. The diagnosis between the two species is as follows:—

beak of corolla gradually tapering to middle, then uniformly slender; tube hardly longer than calyx, sacculate in front at the staminal insertion; lower half of galea suberect; stamens inserted opposite top of ovary, densely pilose at insertion as well as above . . . . . *P. pectinata;*

beak of corolla uniformly slender from its base; tube narrow, straight, half exceeding calyx, not sacculate; lower half of galea inclined forwards; stamens inserted above middle of tube, glabrous at insertion and only sparingly hirsute above . . . . . *P. pyramidata.*

In floral structure *P. pectinata* is more nearly allied to *P. tenuirostris* than to *P. pyramidata; P. tenuirostris* has the same peculiar transverse furrow at the staminal insertion (a character so far peculiar to these two species), and has identical stamens; its only diagnostic marks are its yellow (not purple) corolla, its more slender beak, its denser spike, and its less incised sessile cauline leaves. The capsules, and more especially the seeds, in these three species are scarcely distinguishable (*see* Plate 37).

19. Pedicularis tenuirostris *Benth.* (1835).

Elata 4-fariam pilosa rhizomate incrassato extus crustaceo caulibus erectis strictis teretibus simplicibus ramosisve ramis gracilibus foliisque 4-natim verticillatis foliis lanceolatis lanceolato-linearibusve radicalibus petiolatis caulinis sessilibus pinnatifidis -sectisve segmentis 15—25-jugis oblongis obtusis margine serrato-dentatis floribus dense spicatis sessilibus bracteis ovatis acuminatis margine villosulis integris calycis campanulati antice vix fissi costis hirsuti 5-dentati demum inflati segmentis æqualibus late lanceolatis acutis margine integris corollæ tubo calyce æquilongo antice ad insertionem filamentorum leviter sacculato labio obovato antice 3-lobo lobis lateralibus ovatis medio suborbiculato dimidio majoribus galea inflata angulo recto incurva parte basali sursum parum ampliata fauce bisinuata fere erecta parte antherigera horizontali in rostrum a medio gracillimum basi porrectum apice acuto integro circinnate deflexum producta staminibus in sacculo ex adverso summi ovarii insertis filamentis basi et supra medium dense rufo-villosis ceterum

glabris ovario ovato stigmate incluso capsula late ovata acuminata parum exserta seminibus majusculis ovatis testa pallidis rugosis profunde reticulatis.—P. tenuirostris *Benth.*, *Scroph. Ind.* 52; *Walp.*, *Rep.* iii, 411; *Benth.*, *DC. Prodr.* x, 561; *Hook. f.*, *Flor. Brit. Ind.* iv, 307; *Maxim.*, *Mel. Biol.* xii, 811, *t.* 2, *f.* 26.

In Himalaya occidentali:—Kashmir: Ventisur, *Falconer* (bis)! Sonamurg, 10,500 p. s. m., et Kunzalwan, 7,500, *Clarke!* in valle Sind, *Stoliczka!* Pangi, *Stoliczka! Brandis!* Song, 9,000 p. s. m., *Brandis!* Chamba, *Ellis!* Dharwas, 10,000 p. s. m., *Baden-Powell! Tibet occ.;* 10,000 p. s. m., *Thomson!* Lahul, 9,500 p. s. m. *Brandis! Jæschke*, n. 230! *Watt!* Gilgit, *Biddulph! Giles!* Tehri Garhwal; in valle fl. Ganges, supra Derali, 8—9,000 p. s. m., *Duthie* (561)! in valle Nila, 10—11,000 p. s. m., *Duthie* (561*a*)! in valle fl. Ganges inter Byramghati et Gangutri, 10,000 p. s. m., *Duthie* (1873; spp. optima fructigera nomine "*P. pyramidata*" distributa)!

Caulibus 40—80 cm. altis cygni pennæ crassitudine, rhizomate 8—12 cm. longo 0·5—1 cm. crasso ramis 5—15 cm. longis; foliis maximis 12 cm. longis his 4 cm. latis sæpissime tamen 8 × 2 cm. foliis inferioribus nonnunquam brevius petiolatis, segmentis 6—3 × 10—5 mm.; calyce 10 × 5 mm., corollæ tubo 10 mm. longo galea parte basali 4 × 3 mm. parte antherigera 5 × 3·5 mm. rostro 9 mm. longo labio 12 mm. lato; capsula 11 × 6 mm. seminibus 3 mm. longis his 1·75 mm. latis. Julio et Augusto floret; corolla lutea.

Plate 24. C; figs. 8—15.—Pedicularis tenuirostris *Benth.*

Specimen from Lahul (Jæschke n. 230).

This account of *P. tenuirostris* is based on the examination of 39 specimens (23 gatherings), with analyses of flowers from 35 specimens. The species is at once diagnosed both from *P. pyramidata* and *P. pectinata* by its sessile cauline leaves. Duthie n. 1873 (issued as "P. pyramidata") is a gathering of excellent fruiting specimens of this; the original specimen preserved at Saharanpur still retains some corollas.

20. **Pedicularis pyramidata** *Royle* (1835).

Elata sparse 3—4-fariam pilosa rhizomate crasso horizontali collo pluricipite caulibus erectis teretibus fistulosis sæpissime simplicibus foliis 3—4-natim verticillatis petiolatis petiolis radicalibus longissimis laminis oblongo-lanceolatis acutis pinnatisectis -partitisve segmentis 8—15-jugis linearibus serratis vel lanceolatis pinnatifidis serrato-dentatis floribus subsessilibus dense spicatis bracteis inferioribus lanceolatis apice serratis reliquis ovatis acutis integris calycis campanulato-ovati hirsuti 5-dentati segmentis ovatis acuminatis margine integris corollæ tubo calyce dimidio longiore labio obcordato antice 3-lobo lobis lateralibus ovatis medio 3-plo latioribus galea inflata angulo recto incurva parte basali inclinata parte antherigera horizontali in rostrum a basi tenue abrupte producta staminibus nunc medio nunc fere apice tubi insertis superne tantum parce hirsutis ovario ovato stigmate incluso capsula late ovata acuminata parum exserta seminibus majusculis ovatis testa pallidis profunde reticulatis.—P. pyramidata *Royle in Benth.*, *Scroph. Ind.* 52; *Lindley*, *Bot. Reg.* n. s. xiv, *Pl. Misc.*, 155; *Walp.*, *Rep.* iii, 411; *Benth.*, *DC. Prodr.* x, 560; *Maxim.*, *Mel. Biol.* xii, 810, *t.* 2, *f.* 27; *Prain*, *Jour. As. Soc. Beng.* lviii, 2, 256.—P. tenuirostris *Aitchison*, *Jour. Linn. Soc.* xviii (1880), 84 (*nec Benth.*).—P. pectinata *Aitchison*, *Jour. Linn. Soc.* xviii (1880), 84 (*nec Wall.*).

In Himalaya occidentali:—Kashmir, Davesu kind, *Royle!* Pyr Panjal, *Sedgwick!* Kala Pani, 10,500 p. s. m., *Giles!* Deosan, 13,000 p. s. m. et Kunzewan, 7,500 p. s. m., *Clarke!* Gilgit: *Biddulph! Giles!* Afghanistan: Safed Koh, 9,500 p. s. m., *Collett* (122)! Shendtoi, *Aitchison* (n. 796 nomine "P. pectinata" edit.)! et in vallo Kurram (n.o nomine "P. tenuirostris" edit.)! Lahul, in pratis, 10,000 p. s. m., *Brandis! Hay!* in valle fl. Bhaga, 9,500—13,000 p. s. m., *Stoliczka!*

Caulibus 40—100 cm. altis cygni pennæ crassitudine, rhizomate 8—12 cm. longo hoc 0·5—1 cm. crasso; foliis maximis petiolis 5—8 cm. longis, laminis 5—9 cm. × 2—3 cm. segmentis 5—15 mm. × 3 mm.; calyce 10 mm. longo hoc 5 mm. lato, corollæ tubo 13—16 mm. longo, galeæ parte basali 3·5 × 3 mm. parte antherigera 5 × 3·5 mm. rostro 11 mm. longo labio 12 mm. lato; capsula 11 × 6 mm. seminibus 3 mm. longis his 1·75 mm. latis. Julio-Augusto floret; corolla purpurea vel rosea.

Plate 24. A, B; figs. 1—7.—Pedicularis pyramidata *Royle.*

A—Specimen from Lahul (Brandis).
B— ,, ,, Safed Koh, Afghanistan (Collett n. 122).

This account of *P. pyramidata* is based on the analysis of flowers from 39 specimens. The species is closely allied to *P. pectinata*, of which it appears to be the representative in the trans-Indus Himalayan district. The areas affected by the two species are distinct in the outer Himalayan ranges and hardly overlap in the inner ranges. The time has not yet arrived for the treatment of this plant as a mere variety of *P. pectinata;* the diagnosis has been already given under that species.

21. Pedicularis Oliveriana *Prain* (1889).

Elata glabra caulibus simplicibus gracilibus foliis 4-natim verticillatis breve petiolatis ovatis lanceolatisve pinnatisectis rhachi alatis segmentis 8—10-jugis acutis lanceolatis pinnatifidis laciniis ovatis cartilagineo-serratis floribus subsessilibus spicis interruptis verticillastris 4-floris bracteis inferioribus foliaceis summis linearibus margine dentatis calycis campanulati 5-dentati segmentis supparibus parvis acutis margine serratis corollæ tubo calycem parum excedente labio obcordato antice 3-lobo lobis lateralibus ovatis medio rotundato duplo majoribus galea subinflata angulo subacuto incurva parte basali erecta tubo æquilata parte antherigera deflexa in rostrum circinnatum apice acuto integro sursum spectante sensim producta staminibus medio tubo insertis filamentis glabris ovario ovato acuminato stigmate incluso.—P. Oliveriana *Prain, Jour. As. Soc. Beng.* lviii, 2, 257.

In Himalaya orientali:—Phari; *Kingii mercenar.!*

Caulibus pennâ anserinâ crassis spicis longioribus 20—25 cm., petiolis caulinis 0·5 cm., laminis 2—3 × 1 cm. segmentis 8 × 2 mm.; pedicellis 0—2 mm. calyce 5—6 mm. corollæ tubo 7 mm. longo galea parte basali 2·5 × 1·5 mm. parte antherigera 3·5 × 2 mm. rostro 7 mm. longo labio 7—8 mm. lato, ovario 4 mm. longo.

Plate 22. A; figs. 1—7.—Pedicularis Oliveriana *Prain.*

Specimen from Phari (Lama Ujyen Gyatsko, n. 76).

The Lama brought from Phari one gathering of this plant by itself. From one of these specimens the figure 22A is drawn. During the same journey he must have met

with it frequently, for he has collected it alongside of, and sent specimens mixed with, gatherings of *P. gracilis*, *P. alaschanica*, *P. mollis*, and *P. globifera*. None of Dr. King's other collectors have met with it.

There are neither roots nor capsules and the colour of the corolla is not noted, but the flowering spikes are quite capable of description, and from the specimens it seems as if the flowers had been purple. The species belongs to a group not represented in India by another form; its nearest ally is *P. semitorta* Maxim. The diagnosis between them is as follows:—

bracts narrow, simple; calyx not cleft anteriorly; corolla throat edentulous;
all filaments glabrous; corolla (?) purple . . . . . *P. Oliveriana;*
bracts triangular, 3-fid; calyx anteriorly cleft; corolla throat toothed;
anterior filaments hirsute; corolla certainly yellow . . . . . *P. semitorta.*

22. Pedicularis brevifolia *Don* (1825).

Elata pubescens vel glabra rhizomate brevissimo lignoso radicibus cæspitosis fibrosis caule gracili erecto terete simplice vel e basi ramoso foliis petiolatis radicalibus cæspitosis demum evanidis caulinis 2—4-natim verticillatis lanceolatis ovatisve pinnatisectis -partitisve segmentis 7—9-jugis contiguis oblongis inciso-serratis vel pinnatifidis floribus sessilibus 4-ternis verticillato-spicatis verticillis inferioribus distantibus bracteis foliaceis breviter petiolatis summis confertis bracteis sessilibus calycis membranacei breve campanulati 5-fidi dente postico subulato integro reliquis oblongis cristato-serratis minore corollæ tubo calyce sesquilongiore labio 3-lobo lobis lateralibus ovatis medio orbiculare parum latioribus galea subinflata angulo recto incurva parte basali erecta tubo æquilata parte antherigera horizontali in rostrum deflexo-porrectum a basi tenue apice obtuso emarginatum producta staminibus ex adverso summi ovarii insertis filamentis glabris ovario ovato stigmate exserto capsula ovata oblique acuminata calyce dimidio longiore seminibus ovoideis fulvis distincte reticulatis.—P. brevifolia *Don*, *Prodr. Flor. Nepal.* 94; *Benth.*, *Scroph. Ind.* 53; *Walp.*, *Rep.* iii, 411; *Benth.*, *DC. Prodr.* x, 561; *Hook. f.*, *Flor. Brit. Ind.* iv, 307.—P. lanigera *Wall.*, *Cat.* 419 (*pro maxima parte*) (1828).

In Himalaya occidentali:—Kashmir, 11,000 p. s. m., *Bellew!* Lahul, *Jæschke!* Kamaon, ad Palang Gadh, 11—12,000 p. s. m., *Duthie!* Nepal:—ex adverso pagi Budhi, 10—11,000 p. s. m., *Duthie!* in Gosain Than, *Wallich!* Julio-Augusto floret; corolla purpurea vel rosea.

Caulibus 12—30 cm. altis, radicibus 4 cm. longis, petiolis 0·5—1 cm. laminis 2 cm. longis his 0·5—1·25 cm. latis segmentis 3—4 × 1·5—2·5 mm., pedicellis 0—2·5 mm., calyce 6 × 3 mm., corollæ tubo 8 mm. longo galea parte basali 2·5 × 1·5 mm. parte antherigera 4 × 2·5 mm. rostro 7—9 mm. longo labio 16 mm. lato, capsula 11 mm. longa hac 5·5 mm. lata, seminibus 1·25 mm. longis his 0·75 mm. latis.

Plate 26. A—C; figs. 1—7.—Pedicularis brevifolia *Don*.

A—Specimen from Palang Gadh, Byaus (Duthie, n. 5837 in Herb. Saharanpur).
B— ,, ,, Kashmir, with deeply 2-fid apex of beak.
C— ,, ,, Lahul, with opposite leaves (Jæschke, n. 235 in Herb. Calcutta).

This account of *P. brevifolia* is based on the examination of 22 specimens. There are two distinct forms assumed by the species:—

(*a*) "vera;" tall, erect, leaves 4-nate lanceolate pinnatipartite petioles 0 for upper leaves short for lower, spikes elongated in flower, whorls 3—5 cm. distant. This form

repeats the habit, and largely the foliage, of *P. instar* and *P. denudata*, and seems restricted to Nepal and Kamaon; and

(β) "tibetica;" shorter, ascending, petioles longer, leaves 3-nate or opposite, ovate-oblong, pinnatisect, spikes subcapitate in flower, only slightly elongated in fruit. This form repeats the habit of *P. confertiflora*, and seems confined to the Panjab-Himalayan district.

Don's description applies to the Nepal-Kamaon form only, but is excellent, and emphasises the character of 'obtuse emarginate apex of beak,' which is alone sufficient to diagnose the species from all those to which it is closely allied. There is at Calcutta a sheet "ex herb. R. Brown," named *P. brevifolia* by Don himself, collected in 1819 in Gosain Than by Wallich. With this plant Duthie's Kamaon and West Nepal specimens altogether agree. This, Dr. King tells me, is the plant named "P. lanigera" (*Wall. Cat.* n. 419) at the rooms of the Linnean Society of London; it is also *Wall. Cat.* n. 419 at Kew; and is, Mr. Maximowicz tells me, the plant of *Wall. Cat.* n. 419 at St. Petersburg. At Calcutta, however, the specimen representing *Wall. Cat.* n. 419 is a plant with alternate leaves, and is the densely-woolly form of *P. carnosa* that occurs along with the normal form in the Kamaon and Punjab-Himalayan districts. This may well be the case in other herbaria also, and the fact is noted here to obviate misunderstanding on the part of consultants. Both in the field and in herbaria form "vera" has been treated as a form of *P. porrecta*. Form "tibetica," on the other hand, which has been very generally accepted as "P. brevifolia," has had mixed with it two other species—*P. Heydei* and *P. confertiflora*. The following are diagnoses of each of these in turn:—

flowers numerous, spiked; stamens inserted opposite top of ovary; lobes of lip rounded; beak deeply emarginate, obtuse at apex; leaves usually 3—4-nate; plant hirsute . . . . . *P. brevifolia*;
flowers few axillary; stamens inserted above middle of tube; mid-lobe of lip rhomboid; beak entire acute at apex; leaves usually opposite; plant glabrous . . . . . *P. porrecta*.

---

leaves oblong-ovate; stamens inserted opposite top of ovary; lip large 3-fid, equalling beak with emarginate obtuse apex; roots fibrous . . *P. brevifolia*;
leaves narrowly lanceolate; stamens inserted near apex of tube; lip very small, margin sinuate, hardly lobed, much shorter than beak with entire acute apex; roots fleshy . . . . . *P. Heydei*.

---

bracts foliar; stamens inserted opposite top of ovary; beak obtuse emarginate at apex; corolla tube hardly exceeding calyx . . . *P. brevifolia*;
bracts 3—7-fid; segments lanceolate; stamens inserted in middle of tube; beak acute entire at apex; corolla tube twice as long as calyx . . . *P. confertiflora*.

Besides these species, which are known to have been mixed with *P. brevifolia* in distribution, it much resembles the typical variety of the next species, *P. instar*. The diagnosis is as follows:—

lip 3-fid; apex of beak obtuse emarginate . . . . . *P. brevifolia*;
lip 3-partite; apex of beak acute entire . . . . . *P. instar*.

23. **Pedicularis instar** *Prain* (1888).

Elata vel nana pubescens rhizomate brevissimo radicibus cæspitosis fibrosis caule gracili erecto terete simplice vel e basi ramoso foliis minimis radicalibus longe petiolatis cæspitosis mox evanidis caulinis subsessilibus 2—4-natim verticillatis lanceolatis oblongisve pinnatilobis segmentis 7—9-jugis contiguis brevissimis ovatis et minute serratis floribus subsessilibus 4-ternis verticillato-spicatis verticillis inferioribus distantibus summis confertis bracteis foliaceis imis sæpe foliis caulinis longioribus calycis herbacei campanulati 5-dentati segmento postico integro reliquis cristato-serratis corollæ tubo calyce sesquilongiore labio 3-partito lobis obovatis lateralibus medio parum angustioribus galea subinflata angulo recto incurva parte basali erecta tubo æquilata parte antherigera horizontali in rostrum deflexo-porrectum a basi tenue apice acuto integerrimo producta staminibus medio inter summum ovarium et tubi apicem insertis filamentis glabris ovario ovato mucronato stigmate subexserto capsula ovata oblique acuminata calycem dimidio duplove superante seminibus ovoideis fulvis distincte reticulatis.

VAR. *typica;* caule elato erecto stricto foliis caulinis 4-natim verticillatis ovato-oblongis sessilibus calyce late breve campanulato dentibus magnis ovatis rostro labio manifeste breviore capsula late ovata calyce dimidio longiore.—P. instar *Prain in Maxim. Mel. Biol.* xii, 815, *t.* 2, *f.* 32; *Jour. As. Soc. Beng.* lviii, 2, 257.

In HIMALAYA orientali:—Sikkim, Ong-la-thang, infra Kinchinjanga; et in Pey-kiong-la, 13,000 p. s. m., *Kingii mercenar.!*

VAR. *paradoxa;* caulibus sæpius cæspitosis nanis foliis caulinis lanceolatis inferioribus brevissime petiolatis sæpissime oppositis nonnunquam verticillo inferiore 3—4-natim dispositis calyce angustiore oblongo rostro labio æquilongo capsula anguste ovata calyce duplo longiore.—P. instar VAR. paradoxa *Prain*, *Jour. As. Soc. Beng.* lviii, 2, 257.

In HIMALAYA orientali:—Nepal orientali: ad Nia-pokri, 12,000 p. s. m.; Jongri, ad Bijan 12,000 p. s. m., *Kingii mercenar.!*

Julio—Augusto floret; corolla rubra.

Caule VAR. *typicæ* 20—50 cm. alto VAR. *paradoxæ* 2—8 cm., radicibus 3—5 cm. longis, petiolis radicalibus 1—2 cm. laminis 0·75—1·5 cm. longis his VAR. *typicæ* 0·5 cm., VAR. *paradoxæ* vix 0·25 cm. latis segmentis 1 mm. longis his 2 mm. latis; pedicellis 0·3 mm., calyce VAR. *typicæ* 5 × 4 mm. VAR. *paradoxæ* 6·5 × 3·5 mm. corollæ tubo 7 mm. long galeæ parte basali 2 mm. longa hac 1·5 mm. lata parte antherigera 4 × 2·5 mm. rostro VAR. *typicæ* 3—3·5 mm. longo VAR. *paradoxæ* 6—7 mm. longo labio 10 mm. lato; capsula VAR. *typicæ* 8 mm. longa hac 4·5 mm. lata VAR. *paradoxæ* 12 mm. longa vix 3 mm. lata.

PLATE 26. D, E; figs. 8—19.—Pedicularis instar *Prain.*

D—Specimen of VAR. *typica* from Ong-la-thang, Jongri.
E— „ „ *paradoxa* from Nia-pokri, Jongri.

This account is based on an examination of 15 specimens of VAR. *typica* and 58 specimens of VAR. *paradoxa.* The most nearly allied species is *P. brevifolia*, the Kamaon-Nepal form of which VAR. *typica* closely resembles; the diagnosis has been already given.

P. Heydei sometimes much resembles VAR. *paradoxa*, but the small hardly-lobed lip of that species at once distinguishes it from this. But VAR. *typica* most closely imitates the habit, foliage, and calyx of *P. denudata*, while VAR. *paradoxa* equally strikingly repeats the same characters of *P. polygaloides*. In these two species, however, which in vegetative characters differ as widely as do the two varieties of *P. instar*, the corollas, though very closely resembling each other, are separable by staminal characters,—filaments hirsute in *P. denudata*, glabrous in *P. polygaloides*. The only difference between the two varieties of *P. instar*, on the other hand, is that the beak is longer in VAR. *paradoxa* than it is in the type. This single character is not sufficient to separate the two as distinct species.

24. Pedicularis gracilis *Wall.* (1828).

Elata vel decumbens 2—4-fariam pilosa rhizomate lignoso sæpissime incrassato radicibus fibrosis caulibus singulis vel cæspitosis gracilibus vel strictis simplicibus vel semel iterumve ramosis foliis ramisque oppositis vel 3—4-natim verticillatis radicalibus mox evanescentibus caulinis subsessilibus ovato-oblongis pinnatisectis segmentis 6—9-jugis oblongis obtusis inciso-serratis floribus breve pedicellatis gracillime paniculatis racemosisve vel omnibus axillaribus distantibus calycis cylindrico-oblongi membranacei glabri vel pubescentis nec fissi 5-dentati segmentis brevibus sæpissime integerrimis corollæ tubo calycem parum excedente labio suborbiculare antice 3-lobo lobis lateralibus ovatis medio rhomboideo-ovato duplo majoribus galea subinflata angulo recto incurva parte basali erecta tubo æquilata parte antherigera horizontali in rostrum deflexo-porrectum a basi tenue apice acuto integerrimo producta staminibus medio tubo vel paulo altius insertis filamentis glaberrimis ovario ovato stigmate exserto capsula late ovata acuta parum vel dimidio calyce longiore seminibus ovoideis fulvo-cinereis distincte reticulatis.

VAR. *typica;* erecta vel procumbens caule lineis pilosis exceptis foliisque glabro foliis caulinis majoribus ramealibus parvulis bracteis foliisque distincte petiolatis calyce margine villosulo sinuato vix dentato capsula vix exserta staminibus medio tubo insertis.—P. gracilis *Wall.*, *Cat.* 413; *Benth.*, *Scroph. Ind.* 52; *Walp.*, *Rep.* iii, 411; *Benth.*, *DC. Prodr.* x, 561; *Hook. f.*, *Flor. Brit. Ind.* iv, 307.—P. stricta *Wall.*, *Cat.* 414 (1828).—P. Brunoniana *Wall.*, *Cat.* 422 (1828).

1. Formæ "veræ" distributio (*Wall.*, *Cat.* 413).

In HIMALAYA occidentali:—Dranti, in jugo, 12,000 p. s. m., *Baden-Powell* (n. 267)! Tehri-Garhwal; prope Dangalla in valle fl. Ganges, 6—7,000 p. s. m. *Duthie* (n. 1874)! ad ripas fl. Ganges infra Jangla, 8—9,000 p. s. m., *Duthie* (n. 233)! Kamaon: in valle Ralam, 12—13,000 p. s. m., *Duthie* (3224)! Nepal: in montibus Sheopur et in Gosain Than, *Wallich* (*Cat.* n. 413 [*bis*])! *Scully!* In Himalaya orientali:—Sikkim: ad Rheedong, *Kingii mercenar.!* Chumbi: ad Rinchingong in valle Chumbi, et apud Galing, locum inter Chumbi et Phari medium, *Kingii mercenar.!* (spp. hæc omnia cum *P. gracili* Wall. consentanea); in Himalaya occidentali etiam spp. *P. porrectæ* simillima, in Jumnotri ad nives legit *Duthie* (n. 810)! in Lahul legit *Watt!*

2. Formæ "strictæ" distributio (*Wall.*, *Cat.* 414).

In HIMALAYA occidentali:—Kashmir, *Falconer*, n. 794 (pro maxima parte sed cum *P. tenuirostri* in distributione commixta)! Dalhousie, 7,000 p. s. m., *Clarke!* Pauwi; Busahir, 7,000 p. s. m., *Brandis* (3157)! Jaunsar Bahar; in montibus Deoban, 7—8,000 p. s. m.

Duthie (1200 et 1201)! Simla, 7—8,000 p. s. m., *Thomson* (*Herb. Ind. Or.*)! *Stoliczka! Schlich! Gamble* (4775)! Mussoorie, *Royle! King! Duthie!* Kamaon:—*Wallich* (*Cat.* n. 414)! Cheena, *Davidson! Hay!* Byaus, in valle Kali, 9—10,000 p. s. m., *Duthie* (n. 3223)! Tehri-Garhwal, *Duthie!* Kullu, 8—10,000, *Brandis* (3159)! *Watt* (8653)! Nagkanda, *Stoliczka!* ad Bhagi, 9,000 p. s. m., *Watt* (8603)! Tranda, *Stoliczka!* Nepal: Gosain Than, *Wallich* (*Cat.* 414)! et in sched. "ex Herb. R. Brown" (sub nomine P. brevifolia)! *Scully* (202)! in Afghanistan; apud Shendtoi, 9—10,000 p. s. m., *Aitchison!* In Himalaya orientali:—Jongri; apud Bijan, 12,000 p. s. m., *Kingii mercenar.!* Sikkim; Darjeeling, *Hooker* (*Herb. Ind. Or.*)! *Thomson! Anderson! Kurz!* Rad-op-tey, 10,000 p. s. m., *Kingii mercenar.!* Bootan; *Griffith* (631 Jour.)! (spp. hæc omnia cum *P. stricta* Wall. consentanea.)

3. Formæ "prostratæ" distributio (*Wall.*, *Cat.* 422).

In Himalaya occidentali:—Kamaon, *Wallich* (*Cat.* n. 422)! Mussoorie, *King!* In Himalaya orientali:—Sikkim; Darjeeling, *Thomson! Kurz!* Tongloo et Jellapahar, *King!* (spp. hæc omnia cum *P. Brunoniana* Wall. consentanea.)

Var. *macrocarpa;* erecta vel ascendens caule lineis pilosis exceptis foliisque glabro bracteis sessilibus foliis omnibus petiolatis caulinis majoribus ramealibus parvulis calyce distincte dentato segmentis ovatis serratis capsula dimidio exserta staminibus supra medium tubum insertis.

In Himalaya orientali: Phulloot, 10,000 p. s. m., *Thomson!* Tonglo, 8,000 p. s. m., *Anderson!* Phullaloong, 11,000 p. s. m. et Singalelah, 10,000 p. s. m., *Clarke* (13418)! (12732)! Chooa-bamia, prope Singalelah, 12,000 p. s. m. (bis), *Kingii mercenar.!* Chumbi: Taong-shong (bis) *Kingii mercenar.!*

Var. *khasiana;* erecta caule foliisque puberulo bracteis foliisque sessilibus sæpissime basi subauriculatis foliis caulinis ramealibusque parvulis calyce puberulo dentibus brevibus cartilagineis crenulatis acutis capsula vix exserta staminibus medio tubo insertis. Var. khasiana *Hook. f., Flor. Brit. Ind.* iv, 307.

In Assam:—in montibus Khasia; Kala Pani, *Griffith* (Jour. 742)! *Hooker* (*Herb. Ind. Or.*)! Nunklow, *Simons!* Kala Pani, 4,500 p. s. m. et Moflong, 5,500 p. s. m., *Clarke* (6311)! (18579)! In mont. Barêl; supra Konoma, 6500 p. s. m., *Prain!* supra Kegwima, 6,500 p. s. m., *Clarke!* Burma:—in mont. Shan; Toungyi, 5,000 p. s. m. et Koni, 4,000 p. s. m., *Collett!*

Caulibus 40—120 cm. altis, foliis 2·5 × 1·5 cm. segmentis 4—8 × 2 mm. (in var. *khasiana* 0·5 × 0·25 cm. segmentis parvulis), calyce 6 mm. longo hoc 2·5 mm. lato. corollæ tubo 7—8 mm. longo galea parte basali 2 × 1·5 mm. parte antherigera 3 × 2 mm. rostro 5·5 mm. longo labio 10 mm. lato; capsula 8 mm. longa hac 5 mm. lata (in var. *macrocarpa* 11 mm. longa 5 mm. lata), seminibus 1·25—1·5 mm. longis.

Plate 19. A—C; figs. 1—9.—Pedicularis gracilis *Wall.* var. typica.

A—Specimen of form "stricta" from Gosain Than, Nepal (*Wall.*, *Cat.* n. 414 in Herb. Calcutt.).

B—Fruiting specimen of form "stricta" from Sikkim, 10—11,000 (T. Thomson, anno 1857).

C—Specimen of form "prostata" from Kamaon (P. Brunoniana *Wall.*, *Cat.* n. 422 in Herb. Calcutt.).

PLATE 20. D, E; figs. 11—17.—Pedicularis gracilis *Wall.* VAR. typica.

D—Specimen of form "vera" from Nepal (*Wall., Cat.* n. 413 in Herb. Calcutt.).
E— „ „ approaching to *P. porrecta* from Jumnotri, near the snows (Duthie n. 810 in Herb. Saharanpur).

PLATE 21. A—E; figs. 1—13.—Pedicularis gracilis *Wall.* VAR. macrocarpa *Prain* and VAR. khasiana *Hook. f.*

A, C—Specimen of VAR. *macrocarpa* from Jongri; Chooabamia.
B— „ „ „ „ Singalelah (Clarke n. 12732).
D— „ „ *khasiana* from Toungyi, Shan Hills (Collett n. 8).
E— „ „ „ „ Kala Pani, Khasia Hills (Griffith n. 742).

The present account of this widely-distributed and very variable Himalayan species is based on the examination of 164 specimens with dissections of over 250 corollas. Of these specimens 104 have been of VAR. *typica* (form "vera" 25, "stricta" 68, and "prostrata" 11), 36 have been of VAR. *macrocarpa*, and 24 of VAR. *khasiana*.

The species is most nearly allied to *P. porrecta*, which is usually very different in habit. The leaves and calyx of *P. porrecta* are subcoriaceous (in this respect, however, VAR. *khasiana* approaches it), its calyx teeth are distinct and serrate at the apices (in which respects VAR. *macrocarpa* approaches it), while it is much shorter and smaller and is hardly branched (though even in these characters it is approached by an extreme form of VAR. *typica;* Duthie n. 810 in Herb. Saharanpur, and specimens in Herb. G. Watt.). Perhaps *P. porrecta* itself will ultimately have to be regarded as only an extreme variety of *P. gracilis.*

The forms that are included here under *P. gracilis* are as a rule very easily distinguished, but connecting specimens of all kinds occur, and they pass into each other on every hand.

Most easily distinguished of all is VAR. *khasiana*, with small thick cauline leaves, hardly larger than those on the branches, sub-coriaceous calyx with cartilaginous sub-dentate margin, and with a distinct geographical area; (it is confined to the Indo-Chinese Division of the Himalayan province.) But Mr. Duthie has collected in Jaunsar Bahar (n. 1200!) specimens with the membranous calyx and sinuate hardly dentate margin of VAR. *typica*, form "*stricta*," and with the small cauline leaves of VAR. *khasiana.* On the other hand, Mr. Clarke's specimens from Kegwima and my own from Konoma, two localities in the Naga hills, have the calyx and puberulous stems of VAR. *khasiana*, but have the cauline leaves shortly petioled, and therefore connect VAR. *khasiana* with the other two varieties. The Shan hill plant collected by General Collett is exactly the Khasian variety.

The other varieties are confined to the Himalaya proper. Of these, VAR. *macrocarpa* has to be recognised as separate from the typical plant by characters of almost as great weight as those that give *P. porrecta* specific rank. These are its ovate serrate calyx-teeth, its higher staminal insertion, and its much larger capsule. In *facies* all its gatherings very well agree; and though it grows side by side with all the three forms of VAR. *typica*, there are really no intermediate states. Since, however, it is probable that ultimately even *P. porrecta* will require to be reduced to *P. gracilis*, I have not ventured to accord more than varietal rank to this plant.

Of VAR. *typica*, out of which Wallich carved three "species," there are two very distinct forms:—

(*a*) "vera," with slender stems and opposite decussate leaves and flexuose branches (sometimes with leaves and branches 3-nate), and with the calyx margin distinctly, though shortly, toothed, but with the teeth entire = *Wall. Cat.* n. 413; and

(*β*) "stricta," with stouter erect stems and 4-nately whorled leaves and rigid branches (also sometimes with the branches 3-nate), and with the calyx margin not toothed = *Wall. Cat.* n. 414. The true plant is somewhat uncommon, though it is present at Calcutta or at Saharanpur from many of the inner valleys of Kamaon, Nepal, Sikkim, and Chumbi. The erect form (*P. stricta* Wall.) is common everywhere from Afghanistan to Bootan, and it is this form that passes into VAR. *khasiana*. It affects usually grassy slopes and forest glades; when it grows on marshy ground it becomes decumbent and the cauline leaves as well as the radical ones drop off. It then becomes the plant figured on Plate 19C, the distribution of which in the text is given as that of form "prostrata," and is the plant = *Wall.*, *Cat.* n. 422. It is thus really only a state of form "stricta," not a separate form.

25. **Pedicularis Heydei** *Prain* (1889).

Humilis pubescens rhizomate brevissimo radicibus cæspitosis carnosis caulibus gracilibus cæspitosis arcuatis teretibus simplicibus foliis lanceolatis pinnatisectis radicalibus cæspitosis longe petiolatis caulinis 2-paribus oppositis superioribus subsessilibus segmentis 18—25-jugis linearibus dense contiguis floribus breve pedicellatis subspicatis verticillastris summis confertis bracteis oblongis calyce brevioribus calycis crasse herbacei dense villosi oblongi 5-fidi segmentis supparibus lata basi lanceolatis margine crenulatis corollæ tubo calyce plus dimidio longiore labio parvo 3-sinuato margine crenato lobis semicirculis æquilatis galea subinflata angulo recto incurva parte basali erecta parte antherigera horizontali in rostrum deflexo-porrectum labio duplo longius a basi tenue rostro apice acuto integro producta staminibus fere apice tubi insertis filamentis glabris ovario ovato stigmate exserto capsula ovata apice subacuminata vix obliqua calyce dimidio longiore.—P. Heydei *Prain in Jour. As. Soc. Beng.* lviii, 2, 258.

In HIMALAYA occidentali :—Lahul, ad Key-lang, 12,000 p. s. m., *Watt!* Pangi, 11,000—16,500 p. s. m., *Heyde !*

Caulibus 8—14 cm. altis, radicibus 5—6 cm. longis, petiolis radicalibus 3 cm. longis laminis 1·5—2 × 0·5 cm. segmentis 2 × 0·5 mm., pedicellis 2—5 mm., calyce 8 × 3·5 mm., corollæ tubo 12—14 mm., galeæ parte basali 2 × 1 mm. parte antherigera 4 × 1·5 mm. rostro 6—7 mm. longo labio 3·5 mm. longo hoc 5 mm. lato, capsula 11 mm. longa corolla rubra.

PLATE 27. E; figs. 9—14.—Pedicularis Heydei *Prain*.

Specimen from Pangi.

This species is described from two gatherings : one gathering of 10 specimens in *Herb. Calcutt.*, and another of a single specimen in *Herb. G. Watt.* On Dr. Watt's specimen Mr. N. E. Brown had already noted that this is probably a separable form. It is at once diagnosed from *P. brevifolia*, with which it has been hitherto placed, by the entire apex of beak and the very small lip. The lip and the very different calyx separate it from

P. instar VAR. *paradoxa*, which it also resembles. Fig. E represents the proportion of lip and beak accurately. The small figures are erroneous, inasmuch as the lithographer has made them represent the beak shorter than in the drawings from which they were copied.

26. Pedicularis porrecta *Wall.* (1828).

Humilis glabra vel 2—3-fariam hirsuta rhizomate brevissimo radicibus cæspitosis carnosis caulibus cæspitosis simplicibus vel e basi ramosis foliis glabris radicalibus longe petiolatis cæspitosis paucioribus mox evanidis caulinis 1—3 (sæpissime 2) -paribus oppositis inferioribus breve petiolatis summis sessilibus laminis oblongo-ovatis herbaceis pinnatifidis -sectisve segmentis 6—8-jugis oblongis obtusis inciso-serratis floribus axillaribus breve pedicellatis racemis paucifloris calycis oblongi coriacei glaberrimi 5-dentati segmento summo deltoideo integro vicinis triplo latioribus ovatis margine crenato-serratis imis summo æquilatis apice cristatis corollæ tubo calycem duplo superante labio suborbiculare antice 3-lobo lobis lateralibus ovatis medio rhomboideo-ovato duplo majoribus galea subinflata angulo recto incurva parte basali erecta tubo æquilata parte antherigera horizontali in rostrum deflexo-porrectum a basi tenue apice acuto integerrimo producta staminibus infra apicem tubi insertis filamentis glabris ovario ovato stigmate exserto capsula ovata apice subacuminata vix obliqua calyce dimidio longiore seminibus ovoideis fulvis distincte reticulatis.—P. porrecta *Wall.*, *Cat.* 423 ; *Benth.*, *Scroph. Ind.* 52 ; *Walp.*, *Rep.* iii, 411 ; *Benth.*, *DC. Prodr.* x, 561 ; *Hook. f.*, *Flor. Brit. Ind.* iv, 307 ; *Maxim.*, *Mel. Biol.* xii, 818.

In HIMALAYA occidentali:—Kashmir, ad Shalum, *Royle !* Kamaon, *Wallich* (*Cat.* n. 423)! Laka, *Edgeworth !* Garhwal, *King*, (bis)! Kamaon; in valle Ralam, 14—15,000 p. s. m., *Duthie* (3226)! ad Palang Gadh in Byaus, supra Bhowani, 13—15,000 p. s. m. et prope glaciem ad Lebang, 13—15,000 p. s. m., *Duthie !* In Himalaya orientali:—Sikkim ; in Tang-ka-la, *Kingii mercenar. !*

DISTRIB.—Yunnan.

Caulibus 6—30 cm. altis, radicibus 5—6 cm. longis, petiolis radicalibus 1—2 cm. laminis 1·5—2 × 0·75 cm. segmentis 3 × 2 mm.; pedicellis 0—6 mm., calyce 7 mm. longo, corollæ tubo 12—14 mm. longo galeæ parte basali 3 × 1·5 mm. parte antherigera 3·5 × 2 mm. rostro 7 mm. longo labio 10 mm. lato ; capsula 10 mm. longa seminibus 1·25 mm. longis.

PLATE 20. A—C; figs. 1—10.—Pedicularis porrecta *Wall.*

A, figs. 1—3—Specimen from Kamaon (*Wall.*, *Cat.* n. 423 in Herb. Calcutt.).
B, figs. 4—7— „ „ Sikkim ; "Tang-ka-la north of Ze-lep-la at the same elevation."
C, figs. 8 & 9—Specimen from Laka (collected by Edgeworth).
Fig. 10—From Ralam valley. Specimen in Herb. Saharanpur.

This account of *P. porrecta* is based on the dissection of flowers from 39 specimens.

In this species the leaves are always opposite and the bracts are always sessile, the racemes always few (3—8) flowered, the corolla tube is elongated, the calyx and leaves are subcoriaceous, and the stamens are always inserted above the middle of the tube ; so that only extreme conditions of *P. gracilis* (which in its various forms exhibits now one, now another, of these characters, but generally retains its paniculately racemose habit) are likely to give trouble in diagnosis. In doubtful cases, however—so close is the relationship of the two species—we have to rely on the *facies* due to its subcoriaceous texture and on the

elongated corolla tube as the only characters wherein *P. porrecta* finally differs from *P. gracilis*. These are characters which in no other instance are accorded any weight. Since, however, a very different reduction, viz. to *P. brevifolia*, has been proposed, it seems better to allow *P. porrecta* to stand for the present. From *P. brevifolia* it is at once distinguished by its entire apex of beak, and can never be satisfactorily included in that species. From *P. Heydei* it differs by its ovate glabrous leaves with fewer segments, its unequal calyx segments, and its much larger lip.

27. **Pedicularis confertiflora** *Prain* (1889).

Humilis vel elata dense pubescens rhizomate brevi vel elongato lignoso radicibus fibrosis caulibus gracilibus teretibus simplicibus vel e basi ramosis ramo centrali erecto reliquis decumbentibus apice ascendentibus foliis radicalibus petiolatis cæspitosis mox evanidis caulinis 1-paribus oppositis vel 0 subsessilibus omnibus ovato-oblongis pinnatisectis segmentis 5—7-jugis ovatis inciso-serratis floribus breve pedicellatis oppositis vel verticillastro imo nonnunquam 4-floro densius confertis vel verticillo inferiore reliquis remoto bracteis 3-angularibus subfoliaceis 3—7-partitis laciniis sublinearibus basi integris apice cristatis calycis membranacei hirsuti campanulati 5-secti dente postico deltoideo integro reliquis lanceolatis apice cristatis breviore corollæ tubo calyce fere duplo longiore labio late cordato-ovato antice 3-lobo lobo medio orbiculato lateralibus late ovatis faucem amplectentibus et post galeam sese tegentibus plus 3-plo minore galea subinflata angulo recto incurva parte basali sursum leviter extensa parte antherigera fere horizontali in rostrum deflexo-porrectum a basi tenue apice obtuso integerrimo producta staminibus medio tubo insertis filamentis glabris ovario ovato stigmate exserto capsula oblique ovata mucronata calyce dimidio longiore seminibus ovoideis fulvis distincte reticulatis.—P. confertiflora *Prain, Jour. As. Soc. Beng.* lviii, 2, 258.—P. brevifolia *Hert. Ind. Or. H. f. & T. T.* (*spp. Sikkimens.*); *Hook. f., Flor. Brit. Ind.* iv, 307 (*pro parte, nec Don*) (1884).

In Himalaya orientali:—Sikkim, 13—15,000 p. s. m., *Hooker !* Chumbi; ad Reedongoong, prope Chumbi; et apud Ka-poop prope Ze-lep-la, *Kingii mercenar. !* Phari; ad Ting, *Kingii mercenar. !*

Junio—Augusto floret; corolla rosea, vel tubo alba ceterum rosea.

Caulibus 5—25 cm. altis, rhizomate 0—3 cm. longo radicibus 3—5 cm. longis, petiolis 1—3 cm. longis laminis 1—3 × 0·5—1 cm. segmentis 3—5 × 2—4 mm., pedicellis 2—5 mm., calyce 7 × 3·5 mm., corollæ tubo 11 mm. longo galea parte basali 2·5 × 1·5 mm. parte antherigera 4 × 2·5 mm. rostro 7 mm. longo labio 16 mm. lato, capsula 10 mm. longa hac 5 mm. lata seminibus 1·25 mm. longis his 0·75 mm. latis.

Plate 27. A—D; figs. 1—8.—Pedicularis confertiflora *Prain*.

A—Specimen from Ting.
B—Fruiting specimen from Sikkim (*Herb. Ind. Or.*).
C—Specimen from Ka-poop, near Ze-lep-la.
D—Portion of central erect branch from a second specimen of the Ka-poop gathering.

This account is founded on the dissection of flowers from 32 specimens.

The species imitates the habit and foliage of the Panjab-Himalayan form of *P. brevifolia*, and is the Sikkim plant included in *P. brevifolia* in the *Flora of British India.*

The diagnosis has been already given under *P. brevifolia*. But it equally closely resembles in habit *P. tenuicaulis*, from which the diagnosis is effected by the stamens being all glabrous in *P. confertiflora* while the anterior filaments are hirsute in *P. tenuicaulis*; *P. tenuicaulis*, moreover, has very different capsule and seeds. *P. chumbica*, another species that resembles this and agrees with it in having glabrous stamens, is diagnosed by its much elongated corolla tube, its lanceolate capsule, and its filaments inserted at different levels within the corolla tube.

28. **Pedicularis flexuosa** *Hook. f.* (1884).

Humilis vel elata pilosa rhizomate lignoso radicibus cæspitosis fibrosis caulibus numerosis simplicibus vel e basi ramosis ascendentibus foliis caulequo sparse pilis crispis aspersis petiolatis radicalibus cæspitosis caulinis oppositis ovato-oblongis pinnatipartitis rhachi dentatis segmentis 8—14-jugis oblongis pinnatifidis -sectisve laciniis serratis floribus axillaribus pedicellatis inferioribus distantibus summis confertis bracteis foliaceis petiolatis calycis cylindrico-campanulati hirsuti antice triente fissi 5-dentati segmento summo deltoideo integro reliquis cristato-dentatis ellipticis imis duobus summo æquilongo lateralibus duplo brevioribus corollæ tubo extus leviter puberulo calyce plus duplo longiore labio ovato-rotundato antice 3-lobo lobis lateralibus medio plus duplo majoribus galea sub-inflata arcuato-incurva parte basali erecta parte antherigera leviter falcata in rostrum robustum porrectum horizontalem apice obtuso parum emarginato producta staminibus medio inter summum ovarium et apicem tubi insertis filamentis anticis hirsutis ovario lanceolato stigmate exserto capsula ovato-lanceolata acuminata calyce triente longiore seminibus ovatis testa nigris minutissime reticulatis.—P. flexuosa *Hook. f.*, *Flor. Brit. Ind.* iv, 308; *Maxim.*, *Mel. Biol.* xii, 820, *t.* 2, *f.* 35.

In Himalaya orientali:—Sikkim, 10—13,000 p. s. m., *Hooker* (*Herb. Ind. Or.*)! Mon Lepcha, 11,000 p. s. m. *Thomson!* Jongri, 13—15,000 p. s. m. *Anderson!* Singalelah, 11,000 p. s. m. et Jongri, 12,000 p. s. m. *Clarke!* Jongri, 14,000 p. s. m. *Watt!* Kotch-yurong, 15,000 p. s. m.; Tha-moo-tsa, prope Jongri, 12,000 p. s. m.; Beeroom, 13,000 p. s. m.; Natong; Lamteng, 8,800 p. s. m., *Kingii mercenar.!* Chumbi:—ad Rin-chin-gong, *Kingii mercenar.!*

Junio, Julio, et Augusto floret; corolla purpurea.

Caulibus 8—30 cm. altis, rhizomate 2—5 cm. longo radicibus 5—12 cm. longis, petiolis radicalibus 3—6 cm. longis caulinis 1·5 cm. floralibus 0·5—1 cm. laminis maximis 5 × 2·5 cm. segmentis 10 × 6 mm., pedicellis 4—6 mm., calyce 8—9 mm. longo hoc 4 mm. lato, corollæ tubo 18—22 mm. longo galea parte basali 4 × 2·5 mm. parte antherigera 5 × 3 mm. rostro 6 mm. longo labio 12 mm. lato, capsula 9—12 mm. longa seminibus 1·5 mm. longis 0·75 mm. latis.

Plate 18. A, B; figs. 1—8.—Pedicularis flexuosa *Hook. f.*

A—Specimen from Sikkim (*Herb. Ind. Or.* n. 5).
B—Fruiting specimen from Jongri.

This account is based on an examination of 31 flowering and 17 fruiting specimens and on the analyses of 57 corollas. In his very accurate description Mr. Maximowicz states that he has found the filaments inserted at the apex of the tube. A considerable number

of corollas have been examined in order to find, if possible, another instance of this high insertion, but Plate 18, fig. 4, shows the highest point of insertion in any of the flowers analysed; usually it is a little lower than in the case figured. The longer tube and the emarginate apex of beak distinguish this species from *P. tenuicaulis*. From *P. chumbica* it is separated by the emarginate apex of beak and by the anterior filaments being hirsute.

29. **Pedicularis chumbica** *Prain* (1889).

Nana cæspitosa glabra rhizomate nodoso radicibus cæspitosis fusiformibus fibrosisve caulibus numerosis gracillimis brevibus debilibus foliis radicalibus densissime cæspitosis longe petiolatis caulinis 1-paribus oppositis vel 0 floralibusque distincte petiolatis pinnatisectis segmentis 8—10-jugis ovatis contiguis serrato-dentatis floribus paucis pedicellatis confertis vel inferioribus nonnunquam parum remotis calycis cylindrico-campanulati glabri antice triente fissi 5-dentati segmento summo lineari integro reliquis anguste lanceolatis apice cristatis corollæ tubo calyce fere triplo longiore labio antice 3-lobo lobis rotundatis lateralibus medio parum majoribus galea subinflata arcuate incurva parte basali erecta tubo parum latiore parte antherigera falcata in rostrum tenue deflexum apice integro acuto producta staminibus anticis fere medio tubo posticis ex adverso summi ovarii insertis filamentis omnibus glabris ovario lanceolato stigmate exserto capsula recta lanceolata apice acuta calyce fere duplo longiore seminibus paucis ovatis testa nigrescentibus minutissime reticulatis.—P. chumbica *Prain in Jour. As. Soc. Beng.* lviii, 2, 259.

In Himalaya orientali:—Chumbi; ad Za-negang, inter Cho-la et Chumbi medium et apud Put-lo, *Kingii mercenar.!*

Julio floret; corolla purpurea.

Caulibus 4—6 cm. altis, radicibus 4—5 cm. longis petiolis radicalibus 1·5 cm. caulinis floralibusque 0·5 cm. laminis 1 × 0·35 cm. segmentis 2—3 × 1 mm., pedicellis 4—6 mm. longis, calyce 6 mm. longo hoc 3 mm. lato, corollæ tubo 14—18 mm. longo galeæ parte basali 2·5 × 2·5 mm. parte antherigera 4 × 3 mm. rostro 6·5 mm. longo labio 14 mm. lato, capsula 11 mm. longa hac 4·5 mm. lata seminibus 1·25 mm. longis.

Plate 22. B; figs. 8—15.—Pedicularis chumbica *Prain*.

Specimen from Put-lo.

The species is described from an examination of seven specimens. It is closely allied by its calyx, its capsule, and its seeds to *P. flexuosa* and *P. tenuicaulis*; from both it differs by its dwarf habit and its glabrous filaments. From the former it also differs by its entire apex of beak; from the latter by its serrate calyx teeth. It closely repeats the habit and foliage of *P. schizorrhyncha*, which has, however, very different capsules and seeds, and has a short stout truncate beak laciniate at the apex.

30. **Pedicularis tenuicaulis** *Prain* (1889).

Humilis vel elata glabra rhizomate brevi radicibus fibrosis tuberis interspersis caulibus cæspitosis simplicibus gracillimis flexuosis foliis petiolatis radicalibus cæspitosis caulinis

oppositis ovato-oblongis pinnatisectis segmentis 6—8-jugis ovato-lanceolatis pinnatifidis laciniis serrato-dentatis floribus axillaribus pedicellatis inferioribus distantibus summis confertis bracteis petiolatis foliaceis calycis campanulati glabri antice triente fissi 5-dentati segmentis integris summo subulato reliquis lanceolatis ovatis corollæ tubo calyce parum longiore labio 3-lobo lobis rotundatis lateralibus medio duplo majoribus galea subinflata angulo recto incurva parte basali erecta tubo æquilata parte antherigera fere horizontali in rostrum tenue deflexo-porrectum apice acuto integro producta staminibus medio tubo insertis filamentis anticis barbatis ovario ovato-lanceolato stigmate exserto capsula recta lanceolata acuminata calyce dimidio longiore seminibus ovoideis testa nigrescentibus minute reticulatis.—P. tenuicaulis *Prain in Jour. As. Soc. Beng.* lviii, 2, 259.

In Himalaya orientali:—Bijan, 12,000 p. s. m., *Kingii mercenar.!* Chumbi; ad Tan-ka-la et ad Pun-ka-bee-see-mo, *Kingii mercenar.!*

Julio et Augusto floret, corolla punicea.

Caulibus 5—30 cm. altis rhizomate 1—2 cm. radicibus nunc fibrosis tuberis interspersis 3—5 cm. longis nunc omnibus fusiformibus carnosis, petiolis radicalibus 8 cm. longis caulinis 2—4 cm. floralibus 1—2 cm. laminis 2—3 × 1 cm. segmentis 3—5 × 2—3 mm., pedicellis 4—6 mm., calyce 7·5 mm. longo hoc 3 mm. lato, corollæ tubo 8—9 mm. longo galea parte basali 4 × 2 mm. parte antherigera 5 × 2·5 mm. rostro 5 mm. longo labio 11 mm. lato, capsula 10—13 mm. longa hac 4 mm. lata seminibus 1·5 mm. longis his 0·75 mm. latis.

Plate 18. C—E; figs. 9—16.—Pedicularis tenuicaulis *Prain*.

C—Specimen from Tan-ka-la; "north of Ze-lep-la and at the same elevation."
D— „ „ Pan-ka-bee-see-mo.
E—Fruiting specimen from Bijan, 12,000, on the Sikkim-Nepal frontier.

This account of *P. tenuicaulis* is based on an examination of 14 flowering and 30 fruiting specimens, many of the latter (all collected at the same time) having corollas still attached.

The species was originally distributed from Calcutta as a variety of *P. flexuosa*, to which it is most nearly allied. The diagnosis is as follows:—

calyx teeth entire; corolla tube only slightly longer than calyx; beak slightly deflexed, slender, acute, and entire at apex.	*P. tenuicaulis*;
calyx teeth crested, except upper; corolla tube more than twice as long as calyx; beak straight, stouter; apex obtuse emarginate .	*P. flexuosa.*

It is also closely related to *P. chumbica*, the diagnosis being as follows:—

calyx teeth entire; corolla tube only slightly longer than calyx; anterior filaments hirsute	*P. tenuicaulis*;
calyx teeth serrate, except the upper; corolla tube thrice as long as calyx; all filaments glabrous	*P. chumbica.*

The calyx teeth are erroneously shown in the figured plant (Plate 18, C) as serrate; the true condition is that exhibited in the analytical diagrams.

DIVISIO II.—ADUNCÆ Prain.

§§§ Rhyncholophæ Bunge.

Foliis alternis:—
corollæ tubo recto, labio sessili (corolla in *P. curvipede* ignota):—
calyce 5-dentato galeæ rostro falcato versus apicem attenuato:—
foliis majusculis longe petiolatis; caulibus oligophyllis:—
laminis ovatis:—
calyce fere ad basin usque fisso dentibus minutis rostro 2-fido segmentis iterum emarginatis lobulis exteroribus majoribus labio margine eciliato lobis truncatis filamentis glabris . . . . . 31. *P. furfuracea.*
calyce nec fisso dentibus ovatis majoribus rostro 2-fido segmentis iterum emarginatis lobulis exterioribus minoribus labio margine ciliato lobis integris filamentis anticis hirsutis . . . . . 32. *P. Pantlingii.*
laminis lanceolatis:—
calyce $\frac{1}{3}$ fisso, rostro 2-fido haud iterum emarginato labio margine ciliato lobis integris filamentis glabris . 33. *P. microcalyx.*
foliis minimis; caulibus polyphyllis; filamentis omnibus hirsutis:—
calyce vix fisso, rostro labium æquante apice acuto integro . 34. *P. gruina.*
calyce $\frac{1}{3}$ fisso, rostro breve labio multo breviore apice 2-fido . . . . . 35. *P. flagellaris.*
calyce 2-dentato:—
calycis dentibus laminis e basi angusta ovatis (corolla ignota) . 36. *P. curvipes.*
calycis dentibus e lata basi triangularibus ovatisve:—
galea rostro falcato versus apicem acutum integrum attenuato . . . . . 37. *P. carnosa.*
galea erostri:—
tubo calyce 2-plo longiore, galea labium excedente . . 38. *P. corymbosa.*
tubo calycem vix excedente:—
galea labio breviore . . . . . 39. *P. zeylanica.*
galea labio longiore . . . . . 40. *P. Collettii.*
calyce 5-dentato galea rostro porrecto crassiusculo apice obtuso truncato:—
galea fauce utriusque 1-dentata, filamentis anticis hirsutis . . . 41. *P. odontophora.*
galea edentata:—
filamentis omnibus glabris . . . . . 42. *P. albiflora.*
filamentis omnibus hirsutis . . . . . 43. *P. Wallichii.*
corollæ tubo incurvo, labio (*P. trichoglossæ* excepto) stipitato:—
labio sessili, galea rostrata . . . . . 46. *P. trichoglossa.*
labio lata basi stipitato lobis minimis, galea rostrata . . . . . 44. *P. excelsa.*
labio ex angusta basi stipitato, lobis ovatis acutis:—
galea rostrata:—
rostro apice integro penicillato-villoso filamentis medio tubo insertis . . . . . 45. *P. lachnoglossa.*
rostro apice 2-fido filamentis ex adverso summi ovarii insertis 47. *P. Clarkei.*
galea erostri . . . . . 48. *P. Prainiana.*

Foliis oppositis; filamentis anticis hirsutis:—
corollæ tubo recto; labio sessili:—
rostro conico apice emarginato; foliis minimis 4-natim verticillatis . 49. *P. Gammieana.*
rostro cylindrico apice truncato et laciniato foliis lanceolatis oppositis vel caulinis 0 . . . . . 50. *P. schizorrhyncha.*
corollæ tubo incurvo; labio sessili; rostro breve conico apice truncato integro; foliis 4-natim verticillatis . . . . . 51. *P. alaschanica.*

31. Pedicularis furfuracea *Wall.* (1828).

Humilis vel elata glabra rhizomate brevissimo vel parum elongato repente collo paucisquamato squamis lanceolatis membranaceis radicibus fibrosis cæspitosis tuberis interspersis caulibus e basi iterumque ramosis elongatis laxis ascendentibus sparse foliatis foliis radicalibus parvulis mox evanidis caulinis longe petiolatis laminis superne glaberrimis subtus furfuraceis oblongo-ovatis rotundatisve pinnatifidis -partitisve segmentis 5—6-jugis oblongis serrato-dentatis floribus laxe racemosis bracteis foliaceis breve pedicellatis calycis membranacei ovati glabri antice profunde fissi 5-dentati (nonnunquam 2-dentati rarius margine integri) segmentis semper minimis integerrimis corollæ tubo sursum late ampliato calycem vix excedente labio 3-lobo lobis emarginatis ovatis lateralibus medio duplo latioribus galea angulo recto incurva inflata parte basali erecta tubo dimidio angustiore fauce 2-sinuata parte antherigera horizontali in rostrum porrectum apice bifidum segmentis oblique iterum emarginatis lobulis externis ovatis multo majoribus abruptius producta staminibus ex adverso summi ovarii insertis filamentis glaberrimis ovario lanceolato stigmate exserto capsula anguste lanceolata antice sinuata apice acuminata calycem plus duplo excedente seminibus ovato-acutis nigris minutissime reticulatis.—P. furfuracea *Wall.*, *Cat.* 412; *Benth.*, *Scroph. Ind.* 54; *Walp.*, *Rep.* iii, 415; *Benth.*, *DC. Prodr.* x, 580; *Hook. f.*, *Flor. Brit. Ind.* iv, 316; *Maxim.*, *Mel. Biol.* xii, *t.* 3, *f.* 50.

In Himalaya centrali:—Nepal: in Gossain Than, *Wallich! Scully!* In Himalaya orientali:—Sikkim: *Hooker*, *Kurz!* Tonglo, 8—10,000 p. s. m., *Thomson! Anderson! Gamble!* Phalloot, *Thomson!* Ze-lep-la, 9,500 p. s. m., Khe-dhen, Cho-le-la, Yeumthong, Chokka, prope Jongri, 14,000 p. s. m., Tiamphung, Min-zer-dara, Singalelah, 12,000 p. s. m., Lingtoo, 12,000 p. s. m. (bis), *Kingii mercenar.!* Yak-la, 10,000 p. s. m., *Clarke!* Chumbi: apud Rinchingong, in Pan-ka-la et ad Ka-poop, *Kingii mercenar.!*

Junio—Julio floret; corolla sæpissime pallide punicea, nonnunquam alba, et nunc punicea albo-punctata nunc alba puniceo-suffusa notatur.

Caulibus 6—45 cm. altis pennæ corvinæ crassitudine, radicibus 5—12 cm. longis, petiolis 1·5—3 cm. longis laminis 2·5 × 1·5—6 × 4 cm. segmentis 6 × 4—20 × 8 mm., pedicellis 2—5 mm., calyce 6 mm. longo hoc 3 mm. lato, corollæ tubo 7—9 mm. longo galea parte basali 3·5 × 2·5 mm. parte antherigera 5 × 3 mm. rostro 6 mm. longo labio 18 mm. lato, capsula 15 mm. longa hac 4 mm. lata seminibus 2 mm. × 1 mm.

Plate 16. A; figs. 1—9.—Pedicularis furfuracea *Wall.*

Specimen from Gossain Than, Nepal (*Wall.*, *Cat.* n. 412 in Herb. Calcutta).

This account is based on an examination of 95 specimens. The character derived from the apex of the beak is very constant in this and in *P. Pantlingii*, the next species.

These two much resemble each other, but nevertheless differ constantly in all the numerous points given in the diagnosis. The two calyces shown in fig. 3 occurred on the same specimen—one from Lingtoo, in Sikkim.

32. **Pedicularis Pantlingii** *Prain* (1889).

Elata superne pubescens rhizomate brevi lignoso nodoso collo sæpius multicaule radicibus cæspitosis fibrosis caulibus simplicibus elongatis strictis foliosis foliis longe petiolatis superne pilis brevibus albis sub lente aspersis subtus furfuraceis late ovatis basi subcordatis subintegris vel pinnatilobis lobis rotundatis margine dentatis, floribus dense racemosis demum distantibus bracteis foliaceis breve pedicellatis calycis campanulati hirsuti vix fissi 5-dentati segmentis lateralibus ovatis inciso-serratis postico deltoideo integro parum majoribus corollæ tubo sursum parum ampliato calyce æquilongo labio 3-lobo margine ciliato lobis lateralibus ovatis medio orbiculato 3-plo latioribus galea subinflata angulo abruptiore incurva parte basali tubo æquilata erecta parte antherigera horizontali in rostrum deflexo-porrectum apice bifidum segmentis oblique iterum emarginatis lobulis externis minimis abruptius producta staminibus ex adverso summi ovarii insertis filamentis anticis parce puberulis ovario lanceolato stigmate exserto capsula late lanceolata apice acuta calycem plus duplo excedente seminibus late ovatis testa nigra minutissime reticulata.—P. Pantlingii *Prain in Jour. As. Soc. Beng.* lviii, 2, 273.—P. furfuracea VAR. integrifolia *Hook. f., Flor. Brit. Ind.* iv, 316 (1884).—Pedicularis n. 30, *Herb. Ind. Or. H. f. & T.T.*

In HIMALAYA orientali:—Sikkim: *Hooker;* ad Na-tong, 13,000 p. s. m., *Pantling! Kingii mercenar.!* ad Ta-ne-do; in Ze-lep-la; ad Tiamphong, prope Jongri; *Kingii mercenar.!* Nepal orientali: ad Kagling, prope Kang-la 14,000 p. s. m., et ad Bijan, 12,000 p. s. m., *Kingii mercenar.!* Chumbi: in Be-ong-chin-la; *Kingii mercenar.!*

Julio et Augusto floret; corolla pallide purpurea.

Caulibus 40—60 cm. altis cygni pennæ crassitudine, rhizomate 1—3 cm. longo 0·5—1 cm. crasso radicibus 5—8 cm. longis, petiolis 2·5—6 cm. longis laminis 2·5 × 2·5—5 × 4·5 cm. lobis 5 mm. longis 9 mm. latis, pedicellis 0—3 mm., calyce 8 mm. longo hoc 3·5 mm. lato, corollæ tubo 8 mm. longo, galea parte basali 4 × 2·5 mm., parte antherigera 5·5 × 3 mm. rostro 5 mm. longo labio 17 mm. lato, capsula 20 mm. longa hac 6·5 mm. lata seminibus 2 mm. × 1 mm.

PLATE 16. B; figs. 10—17.—Pedicularis Pantlingii *Prain.*

Specimen from Na-tong, Sikkim.

This account is based on the examination of corollas from 43 specimens and capsules from 17 fruiting specimens.

The species is most nearly allied to *P. furfuracea*, and is accounted for in the *Flora of British India* as a variety of that species. It differs, however, sufficiently to be entitled to specific rank. The diagnosis is as follows:—

calyx not cleft teeth large, lobes of lip not truncate margin ciliate; beak 2-fid segments emarginate, outer lobules smaller, anterior filaments puberulous	*P. Pantlingii;*
calyx deeply cleft teeth minute, lobes of lip truncate eciliate, beak 2-fid segments emarginate outer lobules ovate larger, all filaments glabrous	*P. furfuracea.*

33. **Pedicularis microcalyx** *Hook. f.* (1884).

Humilis vel elata glabra vel superne 2-fariam pilosa rhizomate brevissimo vel parum elongato serpente collo squamis ovatis membranaceis paucis vestito radicibus cæspitosis carnosis fusiformibus caule simplici vel rarius e basi ramoso elongato flexuoso gracili oligophyllo foliis longe petiolatis superne glaberrimis subtus furfuraceis lanceolatis basi pinnatisectis ceterum pinnatipartitis rhachi alatis segmentis 8—10-jugis oblongo- lanceolatis pinnatifidis et serratis radicalibus perpaucis mox omnibus evandis caulinis sæpissime 2 floribus racemosis versus apicem confertis inferioribus longe pedicellatis bracteis foliaceis calycis campanulati membranacei antice ad medium fissi 5-dentati segmento postico late lanceolato integro reliquis lanceolatis obtusis apice serratis parum breviore corollæ tubo calycem fere duplo superante labio 3-lobo margine ciliato lobis lateralibus rotundatis medio orbiculato duplo majoribus galea vix inflata angulo abrupto incurva parte basali tubo æquilata erecta parte antherigera horizontali in rostrum leviter deflexum apice segmentis simplicibus acutis bifidum abruptius producta staminibus medio tubo insertis filamentis glaberrimis ovario lanceolato stigmate subexserto capsula lanceolata apice acuminata calyce plus duplo longiore seminibus oblongo-ovatis minutissime reticulatis.—P. microcalyx *Hook f.*, *Flor. Brit. Ind.* iv, 315; *Maxim.*, *Mel. Biol.* xii, 852, *t.* 4, *f.* 71.

In Himalaya orientali:—Sikkim; Lachen, Samdong, et Kankola, 12—15,000 p. s. m., *Hooker;* Jongri, 14,000, *Watt!* Patang-la, Kapur ad fines Nepaliæ versus et ad Choam-put-la, prope Jongri, 15,000 p. s. m., *Kingii mercenar.!* Chumbi, *Kingii mercenar.!*

Caule 10—40 cm. alto, rhizomate 0—2 cm. longo radicibus 3—4·5 cm. longis, petiolis radicalibus 6—8 cm. caulinis 1·5—3 cm. laminis 2·5—6 × 1—1·5 cm. segmentis 5 × 2—3 mm., pedicellis inferioribus usque ad 10 mm. summis 1—3 mm., calyce 5·5 mm. longo hoc 2·5 mm. lato, corollæ tubo 6—9 mm. longo galeæ parte basali 3 mm. longa hac 1·5 mm. lata parte antherigera 5 mm. longa hac 2 mm. lata rostro 5·5 mm. longo labio 11 mm. lato, capsula 16 mm. longa hac 5·5 mm. lata seminibus 1·75 mm. longis, fere 1 mm. latis.

Junio, Julio, et Augusto floret; corolla purpurea.

Plate 16. C; figs. 18—24.—Pedicularis microcalyx *Hook. f.*

Specimen from Patang-la.

This account is based on the examination and analysis of flowers from 36 specimens. It has, as Mr. Maximowicz shows, considerable affinity with the species of the series *Rostratæ*, which it connects with the group *Furfuraceæ*, to which it appears to me rather to belong.

34. **Pedicularis gruina** *Franchet* (1888).

Humilis hirsuta e basi ramosa caule medio erecto subramoso lateralibus procumbentibus radicantibus simplicibus polyphyllis rhizomate brevi fusiformi foliis parvis sparsis petiolatis pinnatipartitis segmentis 5—6-jugis lata basi sessilibus oblongis subrecurvis cartilagineo-serratis floribus axillaribus racemosis basi distantibus apice confertis pedicellis calyce longioribus calycis campanulato-cylindrici hirsuti vix fissi 5-dentati segmentis flabellato-rotundatis mucronato-dentatis basi angustis æqualibus corollæ tubo calycem

paulo superante labio 3-lobato cordato-rotundato breviore quam lato lobis lateralibus oblongo-ovatis medio suborbiculato parvo multo majoribus galea inflata angulo recto incurva parte basali erecta parte antherigera horizontali ad marginem utrinque obtuse auriculata in rostrum porrectum apice acuto integerrimo tantum decurvum sesquilongius sensim attenuata staminibus medio inter summum ovarium et apicem tubi insertis filamentis omnibus barbatis ovario lanceolato-oblongo stigmate subexserto.—P. gruina *Franchet, Maxim., Mel. Biol.* xii, 799, *t.* 1, *f.* 15; *Prain, Jour. As. Soc. Beng.* lviii, 2, 272.

Yunnan:—in monte Che-tscho-tze supra Ta-pin-tze in quercetis, *Delavay;* prope Li-kiang in paludibus, *Delavay;* apud Momyen in paludibus, *J. Anderson!* Corolla purpurea.

Caulibus centralibus 8—10 cm. altis reliquis 12—15 cm. longis foliorum petiolis 0·5—1 cm. laminis 1·5 cm. longis his 0·5 cm. latis segmentis 2—3 mm. distantibus, pedicellis 9—12 mm., calyce 6 mm. longo, corollæ tubo 7·5 mm. galeæ parte basali 3 mm. longo tubo æquilata parte antherigera 3 mm. × 2 mm. rostro 5 mm. longo labio 18 mm. lato, ovario 2·5 mm.

Plate 10. A; figs. 1—5.—Pedicularis gruina *Franchet.*

Specimen from Momyen.

Momyen, the locality of the single Calcutta Herbarium gathering, is just within the Yunnan frontier.

35. **Pedicularis flagellaris** *Benth.* (1846).

Pubescens e basi ramosa caulibus elongatis simplicibus medio erecto reliquis procumbentibus polyphyllis rhizomate brevi fusiformi foliis parvis sparsis petiolatis pinnatisectis segmentis 5—6-jugis sessilibus lanceolatis subrecurvis cartilagineo-serratis floribus axillaribus racemis basi distantibus apice confertis pedicellis calyce brevioribus calycis campanulato-cylindrici pubescentis antice triente fissi 5-dentati segmentis flabellato-rotundatis mucronato-dentatis basi angustatis æqualibus corollæ tubo sursum ampliato calyce fere duplo longiore labio 3-lobato lobis lateralibus ovatis medium parum elongatum dimidio latioribus galea inflata arcuato-incurva parte basali tubo angustiore parum inclinata parte antherigera falcata in rostrum brevissimum apice 2-fidum producta staminibus ex adverso summi ovarii insertis filamentis omnibus hirsutis ovario lanceolato stigmate exserto capsula lanceolata acuminata calyce triente longiore.—P. flagellaris *Benth., DC. Prodr.* x, 561; *Hook. f., Flor. Brit. Ind.* iv, 315.

In Himalaya orientali:—Sikkim, Lachoong, 10--11,000 p. s. m., *Hooker;* in Assam superiore, *Griffith* (n. 3940 *ex Herb. Kew distrib.*)! Khasia, *Oldham!* Corolla rosea.

Caulibus centralibus 15 cm. altis reliquis 20—30 cm. longis, foliorum petiolis 0·5 cm. laminis 1 cm. longis his 0·5 cm. latis segmentis 2—3 mm. distantibus, pediceilis 3—5 mm. longis, calyce 6·5 mm. longo, corollæ tubo 11—13 mm. longo fauce basi dimidio latiore galeæ parte basali 4 mm. longa hac 2 mm. lata tubo inferiore æquilata parte antherigera 4·5 mm. longa hac 2·5 mm. lata rostro 2 mm. longo labio 13 mm. lato, ovario 2·5 mm. longo; capsulæ mihi ignotæ ex ill. *Hookero* descriptio.

Plate 10. B; figs. 6—10.—Pedicularis flagellaris *Benth.*

Specimen from Khasia (Oldham).

The species is here described from a single Khasia gathering and from a fragment of Griffith's Assam plant, the exact locality of which is unknown.

36. **Pedicularis curvipes** *Hook f.* (1884).

Glaberrima ramosa caulibus elongatis gracilibus ramis longioribus arcuatis foliis parvis sparsis petiolatis ovatis pinnatisectis segmentis 3—5-jugis oblongis pinnatifidis et dentatis floribus axillaribus longe pedicellatis pedicellis saltem fructigeris recurvis calycis ovati glabri membranacei antice triente fissi 2-dentati segmentis basi angustioro ovato-lanceolatis flabellatis margine serratis corollæ tubo calyce longiore cylindrico labio et galea etiam nunc ignotis staminibus ex adverso summi ovarii insertis filamentis ignotis capsula pendula oblonga suboblique acuminata calyce dimidio longiore seminibus paucis anguste ellipticis pallidis vix reticulatis.—P. curvipes *Hook. f., Flor. Brit. Ind.* iv, 316; *Maxim., Mel. Biol.* xii, 919; *Clarke, Jour. Linn. Soc.* xxv, 51.

In Himalaya orientali:—Sikkim, apud Tumbok, 10,000 p. s. m., *Clarke.* In Assam; in montibus Barêl, Japvo, 9,000—9,900 p. s. m., *Clarke !*

Caulibus 30 cm., petiolis 8 mm. laminis 8—18 × 6—12 mm., pedicellis 6—10 mm., calycis (8 mm.) limbo sub 6 mm., corollæ tubo 10 mm., capsula 9 mm. × 4 mm. seminibus 2·5 mm. longis his 0·5 mm. latis.

Plate 35. A; figs. 1—4.—Pedicularis curvipes *Hook. f.*

Specimen from Japvo, Naga Hills; (C. B. Clarke, n. 41334B).

This species is described from a single specimen kindly sent to Calcutta by Mr. Clarke, who has met with it twice in rather remote localities and both times in fruit only. From a single withered corolla attached to the tip of the uppermost capsule, I have been able to ascertain the site of staminal insertion and to learn that the lip is sessile. Of the nature of the galea (whether beaked or not) or of the filaments (whether hirsute or glabrous) nothing can yet be said.

37. **Pedicularis carnosa** *Wall.* (1828).

Humilis vel elata hirsuta nonnunquam lanuginosa rarius glabrata rhizomate tenui lignoso radicibus fasciculatis caule gracili flexuoso polyphyllo sæpissime ramoso foliis carnosis vel sæpius herbaceis brevissime petiolatis vel subsessilibus ovatis oblongisve obtusis rarissime lineari-lanceolatis acutis basi attenuatis crenatis denticulatisque floribus axillaribus numerosis pedicellatis racemo elongato laxo foliis summis ad bracteas ovatas calyce vix dimidio longiores reductis calycis hirsuti ovati 2-fidi antice ad medium fissi segmentis nonnunquam divisis ovatis denticulatis corollæ tubo calyce vix dimidio longiore sursum leviter ampliato labio margine ciliato 3-lobo lobis rotundatis lateralibus medio dimidio latioribus galea inflata abruptius arcuato-incurva parte basali erecta parte antherigera fere horizontali in rostrum breve tenuius porrectum apice emarginatum sensim producta staminibus ex adverso summi ovarii insertis filamentis glabris ovario ovato stigmate exserto capsula oblique ovata apice acuminata parum exserta seminibus parvis nigris subsphæricis distincte reticulatis.—P. carnosa *Wall., Cat.* 418 (1828); *Plant. Asiat. Rar.* ii, 44, *t.* 154 (1831); *Benth., Scroph. Ind.* 54; *Walp., Rep.* iii, 415; *Benth., DC. Prodr.* x, 580; *Hook. f., Flor. Brit. Ind.* iv, 313; *Maxim., Mel. Biol.* xii, *t.* 3, *f.* 52.—Rhinanthus bifidus *Ham. in Don Prodr. Flor. Nepal.* 94 (1825).

In Himalaya occidentali:—Dalhousie, 7,000 p. s. m., *Clark (J.)! Clarke (C.B.)!* Simla, 7,000 p. s. m., *Thomson ! Royle ! Gamble ! Schlich ! Hawkes !* Theog, prope Simla,

7,000 p. s. m., *Gamble !* Narkanda et Mattianah, 7,000 p. s. m., *Stoliczka !* Garhwal, *King !* Tehri-Garhwal: supra Phaidi, 5,000—6,000 p. s. m., *Duthie !* in valle Aglar prope Mussoorie, *Duthie !* apud Mussoorie, *King ! Duthie ! Royle ! Falconer !* in valle Kangra: ad Sirhunto, 3,000 p. s. m. et ad Bukkloh, *Clarke !* Cheena, *Davidson !* Sirmur, *Vicary !* Nepal:—ad Narainhati, *Hamilton !* in Gosain Than et in montibus Sheopore, *Wallich !* prope Khatmandu, *Scully !* Sikkim; *Hooker*, *Cunningham !* Khasia:—Kala Pani, etc., 4—6,000 p. s. m., *Simons ! Hooker et Thomson ! Mann !*

DISTRIB.—Yunnan.

Caulibus 8—75 cm. altis, rhizomate 2—5 cm. longo radicibus 3 cm. longis fusiformibus vel fibrosis, petiolis radici propioribus 0·5—1·5 cm. longis summis brevissimis vel 0 laminis foliorum maximorum 4·5 × 1—1·5 cm. minimorum 1·5 × 0·5 cm. segmentis 12—15-jugis sæpissime 1 × 1 mm. nonnunquam 2·5—3 × 2 mm. in laminis inferioribus, pedicellis 2·5—3 mm., calyce 7·5—8 mm., corollæ tubo 10—12 mm. longo apice 3·5 mm. lato galeæ parte basali 4 × 2 mm. parte antherigera 5·5 × 3 mm. rostro 3·5 mm. longo labio 16 mm. lato, capsula 9·5—11 mm. longa seminibus 1 mm. longis.

Junio—Septembre floret; corolla sæpissime margine labii pallide purpurea, parte galeæ antherigera saturate purpurea, labio mediano galeæ parte erecta tuboque albis, nonnunquam tamen floribus concoloribus purpureo-puniceis.

PLATE 14. A; figs. 1—8.—Pedicularis carnosa *Wall.*

Specimen from Mussoorie (G. King in Herb. Calcutt.).

This account of *P. carnosa* is based on the examination of 131 specimens. It is undoubtedly *Rhinanthus bifidus* Ham., a sheet of which with 4 specimens and with Dr. Buchanan-Hamilton's manuscript description affixed is preserved in the Calcutta Herbarium. *P. lanigera* Wall. (Cat. 419), which in the type set (and in most herbaria) is *P. brevifolia* Don, is, at Calcutta, the woolly condition of this species. *Wall. Cat.* 418B (Torenia incisa *Heyne*) is, however, *P. zeylanica* Benth. Its nearest ally is *P. crenata* Maxim., diagnosed by its shorter beak, its lip subequally lobed, its anterior filaments bearded, and its uncleft calyx.

38. **Pedicularis corymbosa** *Prain* (1889).

Humilis vel elata pubescens vel glabra rhizomate tenui lignoso radicibus fasciculatis caule gracili flexuoso polyphyllo sæpissime ramoso foliis carnosis vel herbaceis brevissime petiolatis vel subsessilibus ovatis oblongisve obtusis basi attenuatis crenatis denticulatisque floribus subsessilibus densius ad apicem rami confertis foliis floralibus ad bracteas ovatas sessiles calycem vix dimidio longiores reductis calycis hirsuti vel glabri subcampanulati antice ad medium fissi 2-fidi segmentis ovatis crenato-dentatis corollæ tubo sursum ampliato calyce duplo longiore labio 3-lobo lobis oblongis ovatisve acutis æquilatis galea nec inflata late arcuato-incurva parte basali elongata fauce tubi duplo angustiore inclinata et in partem antherigeram æquilatam vix horizontalem brevissimam erostrem continuata staminibus ex adverso summi ovarii insertis filamentis glaberrimis ovario ovato stigmate exserto capsula oblique ovata apice acuminata parum exserta seminibus parvis nigris subsphæricis distincte reticulatis.—P. corymbosa *Prain in Jour. As. Soc. Beng.* lviii, 2, 277.

In Burma superiore:—In collibus Shan nuncupatis; apud Pwehla, 4,000 p. s. m. et ad Tamakan, 4,000 p. s. m., *Collett!* In colle Maymyo, 4,000 p. s. m., *Kingii mercenar.!* In pratis humidis et in paludosis crescit.

Novembre floret; corolla in speciminibus Collettianis punicea et alba in speciminibus Kingianis concolor rosea.

Caulibus 9—30 cm. altis ramis systemate corymbiformi dispositis, rhizomate 2—5 cm. longo radicibus 3 cm. longis fusiformibus fibrosisve, petiolis radici propioribus 0·5—1·5 cm. longis summis brevissimis vel 0, laminis foliorum maximorum 6 × 1·5 cm. minimorum 3 × 0·5 cm. floralium (subæquimagnorum) 1·5 × 0·5 cm. segmentis 12—15-jugis 2·5 × 4 mm. (in laminis inferioribus), pedicellis 0—2 mm., calyce 12 mm. longo, corollæ tubo 20—25 mm. longo apice 6 mm. lato galeæ parte basali 16 mm. longa hac 3·5 mm. lata parte antherigera 4 mm. longa antice decliva labio 14—20 mm. lato, capsula 12 mm. longa seminibus 1 mm. longis.

Plate 14. B; figs. 9—14.—Pedicularis corymbosa *Prain.*

Specimen from Pwehla, Shan Hills (Collett n. 52).

This species has been described from an examination of 15 specimens. This "pretty little red and white *Pedicularis*," as General Collett has described it in his letters, is very nearly allied to *P. crenata* Maxim., from which it differs in being beakless and in having a longer galea, a narrower lip, glabrous stamens and a cleft calyx. Among Indian species it is, on the one hand, related to *P. carnosa*—between which species and this *P. crenata* stands intermediate as regards corolla; and, on the other hand, to *P. zeylanica*—which differs mainly in having a much shorter corolla-tube and galea. *P. corymbosa* stands, in fact, intermediate between *P. crenata* and *P. zeylanica*, and the four species (*P. carnosa*, *crenata*, *corymbosa*, *zeylanica*) form an exceedingly natural serially disposed group. The Shan Hills plant has stouter and firmer leaves than the Maymyo specimens, which precisely repeat the habit and foliage of Nepalese and Khasia examples of *P. carnosa.*

The name "P. corymbosa" is, I find, already a synonym, having been applied by M. Pallas to a plant which that botanist had already named "P. paniculata." Neither of Pallas' names, Mr. Maximowicz informs me, will ever be received—on their author's authority—since both the plants are simply states of *P. euphrasioides.*

39. Pedicularis zeylanica *Benth.* (1835).

Humilis vel elata pubescens rhizomate tenui lignoso radicibus fasciculatis caule gracili flexuoso polyphyllo sæpissime ramoso foliis carnosis subsessilibus oblongo-lanceolatis obtusis basi attenuatis crenatis denticulatisque floribus subsessilibus axillaribus numerosis dense racemosis foliis floralibus ad bracteas lanceolatas calyce duplo longiores reductis calycis puberuli vel glabri ovati 2-fidi antice ultra medium fissi segmentis ovatis integris vel subcristatis corollæ tubo sursum ampliato intus antice glandulose ciliato calycem dimidio superante labio 3-lobo lobis supparibus nunc omnibus obtusis nunc lateralibus obtusis medio acuto rarius omnibus acutis galea nec inflata leviter arcuata parte basali fauce tubi dimidio angustiore fere erecta et in partem antherigeram leviter inclinatam angustiorem brevissimam subrostratam apicis margine crenatam continuata staminibus ex adverso summi ovarii insertis filamentis omnibus ad insertionem barbatis superne glaberrimis ovario ovato stigmate exserto capsula oblique ovata apice acuminata parum exserta seminibus nigris suborbiculatis distincte reticulatis.—P. zeylanica *Benth.*, *Scroph. Ind.* 54;

Walp., *Rep.* iii, 429; *Benth.*, *DC. Prodr.* x, 580; *Wight*, *Icones* iv, *t.* 1419; *Hook. f.*, *Flor. Brit. Ind.* iv, 317; *Maxim.*, *Mel. Biol.* xii, *t.* 3, *f.* 45.—Pedicularis sp., *Schmid in Baikie*, *Observ. Neilgher.* ed. i, *App.* viii, *t.* 2 (1834).—Torenia incisa *Heyne in Wall. Cat.* 418B (*Lith. Cat. Corrigend. et Addend.* p. 235) (1829).

In India australi:—in montibus Nilghiri, 6,000—7,000 p. s. m., *Heyne* (*Wall.*, *Cat.* n. 418B)! *Wight* (n. 2401)! *Schmid; G. Thompson! Stocks!* prope Ootacamund, *King! Gamble!* In Zeylania:—apud Newera Ellia, 6,000 p. s. m., *Thwaites* (C. P. n. 229)! aliisque locis, nec infrequens.

Caulibus 12—35 cm. altis, ramis nunc fasciatis nunc systemate corymbiformi dispositis, rhizomate 2—5 cm. longo radicibus 3—6 cm. longis fusiformibus fibrosisve, petiolis nullis 0·5 cm. excedentibus laminis foliorum maximorum 4 × 1 cm., minimorum 2·5 × 0·5 cm., floralium 1·5—2 × 0·35 cm. vel angustioribus, segmentis 12—20-jugis 2 × 2 mm., pedicellis 0—2 mm., calyce 8—10 mm. longo, corollæ tubo 12—14 mm. longo apice 5 mm. lato galeæ parte basali 5 × 3·5 mm. parte antherigera 2·5 × 2·5 mm. antice decliva labio 14—18 mm. lato, capsula 13 mm. longa seminibus 1 mm. longis.

Augusto—Septembre floret; corolla punicea vel punicea et alba.

Plate 14. C; figs. 15—21.—Pedicularis zeylanica *Benth.*

Specimen from Ootacamund (Gamble n. 12510).

This species is described from an examination of 31 species. It is = *Torenia incisa* Heyne in Wall. Cat.; a sheet of *Cat.* n. 416B with 4 specimens is preserved at Calcutta. It is well figured in the first edition of Baikie's work on the Nilghiri Hills. Its close affinity to *P. carnosa* has been indicated by Wallich, who issued it (under Heyne's name) in 1829, in association with *P. carnosa* from Nepal; by Bentham in *DC. Prodr. l.c.*, by Wight and by Maximowicz.

The group to which it belongs forms a distinct subdivision of the *Resupinatæ* of Maximowicz (*l.c.* xii, 830).

40. **Pedicularis Collettii** *Prain* (1889).

Elata erecta scabra rhizomate brevissimo radicibus elongatis fusiformibus carnosis horizontalibus caule rigido stricto terete fistuloso hispido-pubescente purpurascente polyphyllo versus apicem fastigiato-ramoso foliis sessilibus late ovatis acutis basi auriculatis subtus hispido-pubescentibus supra rigide subscabris margine crenatis denticulatisque floribus axillaribus numerosis sessilibus spica densa aggregatis foliis summis ad bracteas ovatas acutas margine denticulatas (nec crenatas) vel integras calyce duplo longiores reductis calycis coriacei hispido-pubescentis 2-fidi antice ad medium postice triente fissi segmentis oblongo-lanceolatis integris apice obtusis corollæ tubo sursum ampliato intus antice glandulose ciliato calycem vix dimidio superante labio substipitato basi latiusculo antice 3-lobo lobis orbiculatis æquilatis galea subinflata late arcuato-incurva parte basali fauce tubi duplo angustiore erecta in partem antherigeram subfalcatam rostro brevi conico truncato apice emarginato continuatam staminibus ex adverso medii ovarii insertis filamentis ad insertionem rufo-villosis ceterum glaberrimis ovario-lanceolato acuminato stigmate exserto.—P. Collettii *Prain in Jour. As. Soc. Beng.* lviii, 2, 278.

In Burma superiore:—in collibus Shan nuncupatis; apud Toungyi, 5,000 p. s. m.; in tractu Koni, 4,000 p. s. m., *Collett* (nn. 88, 909)!

Caulibus altissimis, ultra 90 cm., pennæ cygni crassitudine, radicibus 8—12 cm. longis 0·5—1 cm. crassis, foliis radicalibus 0, caulinis (35—40) sparsis intervallis 2—3 cm. longis distantibus laminis maximorum 6 × 2 cm. minimorum 4 × 1·5 cm. floralibus 2 × 1—1 × 0·5 cm., segmentis 12—20-jugis 1—2 × 1 mm. pedicellis vix 1 mm. calyce 14—15 mm. longo 5 mm. lato, corollæ tubo 16—18 mm. longo, galeæ parte basali 8 × 3·5 mm. parte antherigera 9 × 4 mm., rostro 1·5 mm. longo labio 16 mm. lato.

Novembre floret, corolla saturate purpurea; in declivis graminosis crescit.

Plate 15. A; figs. 1—5.—Pedicularis Collettii *Prain*.

Specimen from Koni, Shan Hills (Collett, n. 909).

The species is described from two gatherings, neither of which unfortunately is in fruit. It is most nearly allied to the *Carnosæ* group among Indian species; from these its habit and foliage at once distinguish it. Its most natural allies are, however, the Japanese *P. yezoënsis* and the American *P. lanceolata*. It is, however, one of the most distinct species of the genus.

41. Pedicularis odontophora *Prain* (1889).

Humilis rhizomate serpente nodis squamatis distantibus radicante collo confertim squamato caulibus brevissimis puberulis foliis longe petiolatis radicalibus paucis demum evanidis caulinis sparsis pinnatisectis segmentis 3—5-jugis pinnatifidis laciniis dentatis floribus paucis axillaribus subconfertis pedicellatis calycis cylindrico-campanulati antice parum fissi 5-dentati segmentis integris anticis summoque deltoideis lateralibus subulatis corollæ tubo calycem duplo superante sursum vix ampliato labio 3-lobo lobis ovatis lateralibus medio dimidio majoribus galea subinflata arcuato-incurva parte basali tubo æquilata erecta parte antherigera falcata utrinque obtuse 1-dentata in rostrum porrectum horizontale a basi æquilatum apice truncatum emarginatum producta staminibus medio tubo insertis filamentis anticis omnino et dense hirsutis posticis superne glaberrimis inferne sparse barbatis ovario ovoideo stigmate exserto.

In Himalaya orientali:—Sikkim, ad Natong; Phari, ad Do-tho; *Kingii mercenar.!*

Corollæ tubo labii fauce galeæque parte basali albis, labii margine pallide punicea, galeæ parte antheras fovente rostroque rosea.

Augusto floret; capsula nondum visa.

Rhizomate 5—7 cm. longis internodis 1—2·5 cm., caulibus 2·5—6 cm. altis, foliorum radicalium petiolis 2·5—3 cm. longis caulinorum 0·5—1 cm. laminis ovatis 2—3 cm. longis 2—2·5 cm. latis segmentis 6—12 mm. iis cauli propioribus petiolatis 2—3 mm. longis, pedicellis 2—4 mm. longis, calyce 7 mm. longo, corollæ tubo 13 mm. longo fauce 3 mm. lata galeæ parte basali 3 mm. longa 2 mm. lata parte antherigera 6 mm. longa 2·5 mm. lata, rostro 3·5 mm. longo, labio 11 mm. lato.

Plate 10. D; figs. 18—23.—Pedicularis odontophora *Prain*.

Specimen from Do-tho, 4 miles from Phari.

This very distinct species is described from 14 specimens. Mr. Maximowicz in a letter has suggested that its place is among the *Rostratæ*, and this is almost certainly its true position. It has been placed in the *Cæspitosæ* group of the *Rostratæ* series in the "Conspectus of Affinities," but it is an aberrant member, and perhaps it deserves an independent position.

42. **Pedicularis albiflora** *Prain* (1889).

Humilis cæspitosa glaberrima rhizomate brevissimo lignoso radicibus cæspitosis fusiformibus carnosis collo pluricauli squamis ovatis confertim vestito caulibus brevibus vel subnullis glabris aphyllis foliis radicalibus numerosis cæspitosis longe petiolatis oblongo-lanceolatis pinnatisectis segmentis 5—8-jugis ovatis distantibus mucronato-dentatis floribus paucis breve pedicellatis sparsis vel subconfertis imis alternis summis suboppositis bracteis calyce dimidio longioribus basi obcuneato vaginato-dilatatis 3-sectis segmentis petiolulo angustato ovatis pinnatifidis et mucronato-dentatis calycis cylindrico-campanulati antice vix fissi 5-dentati segmentis integris inæqualibus lanceolatis summo acuto reliquis obtusis corollæ tubo calycem plus duplo superante prorsus angustato labio 3-lobo lobis rotundatis lateralibus medio dimidio majoribus galea nec inflata arcuato-incurva parte basali erecta tubo æquilata parte antherigera falcata in rostrum conicum deflexo-porrectum apice crenatum producta staminibus medio tubo insertis filamentis glaberrimis ovario lanceolato stigmate subexserto.—P. albiflora *Prain in Jour. As. Soc. Beng.* lviii, 2, 273.—P. aspleniifolia VAR. albiflora *Hook. f., Flor. Brit. Ind.* iv, 315 (1884).

In HIMALAYA orientali:—Sikkim; Kan-ko-la, *Hooker; Kingii mercenar. !*

Augusto floret; corolla, ex ill. *Hookero*, alba.

Caulibus 0—8 cm., rhizomate 1 × 0·5 cm. radicibus 4—6 cm., petiolis 2—4 cm., laminis 1·5—2 cm. × 0·5 cm. segmentis 4 × 2 mm., pedicellis 2—5 mm., bracteis 15 mm. × 10 mm., calyce 8—10 mm. longo hoc 3·5 mm. lato, corollæ tubo 20—24 mm. longo galea parte basali 5 × 2·5 mm. parte antherigera 6 × 2·75 mm. rostro 3·5 mm. longo, labio 16 mm. lato.

PLATE 17. C, D; figs. 9—13.—Pedicularis albiflora *Prain*.

Specimens from Kan-ko-la, Sikkim.

Of Indian species this is most nearly allied to *P. odontophora*, but differs by its compressed rhizome, lanceolate leaves, distinct bracts, edentulous throat and glabrous stamens. From its nearest ally (*P. asplenifolia* Floerke) it differs by its peculiar 3-sect bracts, ovate leaf segments, calyx teeth all entire, corolla tube more than twice as long and filaments all glabrous. In *P. asplenifolia* the bracts are foliar, the leaf segments lanceolate, the calyx teeth all serrate, the corolla tube hardly longer than the calyx, and the anterior filaments hirsute. It is allied, but much less closely, to *P. Wallichii* Bunge (*P. asplenifolia* of Wall., but not of Floerke), which differs in its few radical leaves with many long lanceolate, in place of few short ovate, leaf scales, in its subinflated calyx and its filaments all hirsute.

43. **Pedicularis Wallichii** *Bunge* (1843).

Humilis glabra rhizomate incrassato verticali basi radicibus fusiformibus carnosis apice in ramis pluribus supra solum extrusis unicaulibus abeunti ramorum collis squamis lanceolatis vestitis caule simplice subnudo brevi foliis radicalibus paucis (1—4) longe petiolatis caulinis 1—3 lineari-lanceolatis pinnatifidis segmentis 12—25-jugis ovato-lanceolatis crenato-serratis floribus paucis racemo 2—5-floro distincte pedicellatis bracteis foliaceis breve petiolatis crenatis calycis inflato-campanulati coriacei glaberrimi antice parum fissi 5-dentati segmentis lanceolatis supparibus postico subintegro reliquis cristatis corollæ

tubo calycem dimidio superante fauce ipsa parum ampliato labio 3-lobo lobis rotundatis margine sinuatis lateralibus medio dimidio majoribus galea subinflata arcuato-incurva parte basali erecta tubo æquilata parte antherigera falcata in rostrum porrectum fere horizontale apice margine truncato-laciniatum abruptius producta staminibus medio inter summum ovarium et tubi apicem insertis filamentis omnibus superne barbatis ovario ovoideo stigmate exserto capsula lanceolata oblique acuminata seminibus paucis anguste ellipticis testa nigrescentibus vix reticulatis.—P. Wallichii *Bunge in Bull. Scient. Acad. Petersb.* viii (1843), 251 (nomen) et *in Walp., Rep.* iii, 415 (1844); *Prain in Jour. As. Soc. Beng.* lviii, 2, 273.—P. asplenifolia *Wall., Cat.* 416A (1828); *Benth., Scroph. Ind.* 54; *DC. Prodr.* x, 578 (*in parte*).—P. aspleniifolia *Hook. f., Fior. Brit. Ind.* iv, 315 (1884) (*syn. omn. et var. amb. exclus.*); *nequaquam* P. asplenifolia *Floerke.*

In Himalaya centrali et orientali:—Nepal; in Gossain Than, *Wallich* (*Cat.* n. 416A)! Sikkim: ad Samdong et in Tan-ka-la, 14—15,000, *Hooker;* Jongri, 14,000, *Watt!* Patang-la; Ka-pur, infra Kinchinjanga; in Phullaloong, 12,000 p. s. m., *Kingii mercenar.!* Chumbi: ad Lu-ma-poo, *Kingii mercenar.!* Nepal orientali: Kagling, prope Kangla, 14,000 p. s. m. et apud Bijan, ad fines Sikkimenses, 12,000 p. s. m., *Kingii mercenar.!*

Junio, Julio, et Augusto floret; corolla concolor rubra.

Caule 3·5—11 cm. alto rhizomate 5—8 cm. longo hoc 0·5 cm. crasso radicibus 6—8 cm. longis, petiolis 2—6 cm., laminis 2—3 cm. × 0·25—0·5 cm. segmentis 1—2 × 1 mm., bracteis 16 mm. × 3 mm., pedicellis 3—6 mm., calyce 13 mm. longo hoc 6 mm. lato, corollæ tubo 16—18 mm. longo galeæ parte basali 6·5 × 2·5 mm. parte antherigera 6 × 4 mm. rostro 3·5 mm. longo labio 16 mm. lato, capsula 20 mm. longa hac 7·5 mm. lata seminibus 2·5 mm. longis 0·75 mm. latis.

Plate 17. A, B; figs. 1—8.—Pedicularis Wallichii *Bunge.*

A—Specimen from Gossain Than, Nepal (*Wall. Cat.* n. 416A in Herb. Calcutt.).
B—Fruiting specimen from Bijan; Sikkim-Nepal frontier.

This account of *P. Wallichii* is based on the examination of 93 specimens. It must be noted that although Wallich named this species *P. asplenifolia*, he quotes neither Floerke, who first applied this name to a species of *Pedicularis*, nor Willdenow, by whom Floerke's species was first described, as the authority for the name; and it appears probable that Wallich applied the name to this plant (which it suits much better than it does the species that bears it), not from any idea that it was conspecific with Floerke's species, to which it is not remarkably closely related, but because he had either for the moment overlooked the fact that the name was pre-occupied or because he considered with Bentham (*vide* Scroph. Ind. 54, *footnote*) that Floerke's plant was properly reduced to *P. rostrata*, and that therefore he was at liberty to apply the name Floerke had used to designate a different species. But whether this was Wallich's intention or no, Bunge is clearly right in according specific rank to Wallich's plant. It is not, however, more nearly related to *P. rostrata*, as Bunge says, than to *P. asplenifolia*, but is equally distinct from both. Bentham, who in 1835 located Floerke's plant in *P. rostrata* (in this following Steven), in 1846 reconsidered his opinion, restored Floerke's species, and now placed the Wallichian plant within it, treating *P. geminata* Portenschlag (*P. Portenschlagii* Saut.), another species equally well characterised and which, as Reichenbach *f.*, Maximowicz and Steininger show, is quite distinct, in the same way. From both *P. Wallichii* is at once diagnosed by its lanceolate leaf-scales, few radical leaves, very different laminæ, glabrous coriaceous subinflated calyx, much longer corolla

tube and basal part of hood, stamens inserted higher up, filaments all hirsute, narrower longer anthers, much longer capsules and much larger seeds. In habit it apparently more nearly approaches to *P. yunnanensis* and *P. tsangchanensis* than it does to any of the European species with which it has been compared or confounded.

44. **Pedicularis excelsa** *Hook. f.* (1884).

Altissima glabra rhizomate brevi nodoso lignoso radicibus fibrosis cæspitosis caule terete fistuloso ramoso folioso foliis radicalibus caulinisque imis mox evanidis foliis summo caule manentibus circa 12 longe petiolatis laminis magnis ovatis acutis pinnatipartitis rhachis dimidio superiore dentato-alato segmentis 6—15-jugis distantibus oppositis vel imis subalternis ovato-lanceolatis pinnatisectis laciniis 5—9-jugis oblongis obtusis pinnatifidis et mucronato-dentatis floribus breve pedicellatis bracteis ovatis petiolatis foliaceis pinnatifidis calycem æquantibus racemis strictis densifloris calycis ovoidei membranacei margine breviter ciliati antice profunde fissi 5-dentati limbo postice productiore dentibus brevibus obtuse deltoideis integris corollæ mox caducæ tubo sursum leviter ampliato demum dextrorse torto calycem parum superante labio patente margine ciliato e basi lata sensim attenuato ovato-oblongo ipso apice 3-lobo lobis lateralibus minimis orbiculatis medio elongato reflexo et ad rostrum receptum obcucullato galea suberecta margine faucis ampliati densius villosa parte antherigera a parte basali brevissima incerte internosci angulo obtuso in rostrum elongatum deflexum apice integerrimo in lobo labii medio nidulante sensim attenuata staminibus ex adverso summi ovarii insertis filamentis glaberrimis ovario late ovoideo stigmate incluso capsula calyce 4-plo longiore ovato-oblonga apice rotundata oblique reticulata seminibus nigris minute reticulatis.—P. excelsa *Hook. f.*, *Flor. Brit. Ind.* iv, 311; *Maxim.*, *Mel. Biol.* xii, 828, *t.* 3, *f.* 44.

In Himalaya orientali:—Sikkim; Yeumtong, in valle Lachen, 12,000 p. s. m., *Hooker;* inter Tang-ka-la et Chumbi, *Kingii mercenar.!* Chumbi; ad Rinchingong, *Kingii mercenar.!* Phari; ad Ga-ling, *Kingii mercenar.!*

Augusto floret; corolla pallide punicea.

Caule 95—160 cm. alto basi indicis digiti crassitudine, rhizomate 3—4 cm. crasso radicibus 6—8 cm. longis, foliorum petiolis 2—6 cm. longis laminis majorum 13 × 10 cm. minorum 4 × 3 cm. segmentis majoribus 55 × 20 mm. laciniis 8 × 4 mm., racemis 8—20 cm. longis, bracteis 9 mm. longis, calyce 5 mm. longo, corollæ tubo 6 mm. longo, galea 7 mm. longa hac 3 mm. lata rostro 10 mm. longo labio 18 mm. longo basi 6 mm. parte triloba vix 3 mm. lato.

Plate 13. Figs 1—7.—Pedicularis excelsa *Hook. f.*

Specimen from between Tang-ka-la and Chumbi.

This account of *P. excelsa* is based on an examination of 9 specimens, none of which are in fruit; the description of capsule and seeds is taken from the *Flora of British India.* This is a very fine species forming, as Maximowicz *l.c.* shows, a monotypic series that in many respects connects the more usual Rhyncholophous forms with the highly specialised American series *Surrectæ.* The lowest flowers of the raceme at times appear to remain closed till after those higher up are opened, but this is not, as I at first supposed, the rule, as it is in Siphonanthæ. After the flowers are opened the

tip of the beak for some time nestles in the terminal lobule of the lip (fig. 1), but later, owing to the twisting of the galea, the beak is averted from the lip (figs. 2, 3). The corolla then soon falls off, and its caducous character renders the species almost unique among *Pedicularis*, the rule being for the withering corolla to persist and become gradually extruded by the ripening capsule before it finally is blown or falls away. It is impossible to mistake this for any other species at present known.

45. Pedicularis lachnoglossa *Hook. f.* (1884).

Elata glabriuscula rhizomate magnopere incrassato verticali basi radicibus fusiformibus carnosis apice in ramis pluribus supra solum extrusis unicaulibus abeunti ramorum collis et squamis propriis lanceolatis et petiolorum vaginis veterum densissime vestitis caule simplice erecto stricto subnudo foliis radicalibus dense cæspitosis longe petiolatis linearilanceolatis pectinato-pinnatipartitis segmentis 40—60-jugis linearibus acutis distantibus cartilagineo-serrulatis caulinis 1—3 intervallo longo separatis imo tantum petiolo brevi reliquis sessilibus bracteiformibus floribus distincte pedicellatis bracteis linearibus cartilagineo-serratis inferioribus calyce longioribus racemis strictis laxifloris calycis cylindrico-campanulati glabriusculi 5-fidi segmentis margine villosis lanceolatis a medio denticulatis corollæ tubo sursum fauce ipsa parum ampliato calycem parum superante et extra illum incurvo labio parvulo 3-partito lobis margine longiuscule ciliatis ellipticis acutis subæquimagnis galea subinflata angulo subrecto incurva parte basali glabra recta parte antherigera rufo-villosa fere horizontali in rostrum deflexo-porrectum rufo-villosum apice integerrimo villo longissimo denso ornato producta staminibus medio inter summum ovarium et apicem tubi insertis filamentis glaberrimis ovario oblongo-lanceolato stigmate incluso capsula ovato-lanceolata sensim attenuata calyce plus dimidio longiore seminibus anguste ovatis griseo-ochraceis testa laxa perforato-reticulatis.—P. lachnoglossa *Hook. f.*, *Flor. Brit. Ind.* iv, 311; *Maxim.*, *Mel. Biol.* xii, 837, *t.* 3, *f.* 55.

In Himalaya orientali :—Sikkim ; in valle Lachen, 14,000 p. s. m., *Hooker ;* Donkia-la, 15,000 p. s. m., *Kingii mercenar. !* Chumbi ;—Cho-le-la, Pat-ze-la, Koo-ma py-a (bis), *Kingii mercenar. !* Phari;—*Kingii mercenar. !*

Distrib.—Yunnan.

Julio—Augusto floret; corolla rubra, purpurea, vel, rarius, sordide alba.

Caule 12—45 cm. alto, rhizomate cactoideo extus crustaceo 7—12 cm. longo hoc 0·5—1·5 cm. crasso, foliorum petiolis 3—10 cm. longis laminis 5—12 cm. longis 1—1·5 cm. latis segmentis 6 × 2 mm., pedicellis 5 mm. longis, racemis usque ad 20 cm. extensis floribus 10—20 mm. remotis bracteis 15—25 mm. longis, calyce 10 mm. longo 4 mm. lato corollæ tubo 12 mm. longo galea parte basali 3·5 × 2 mm. parte antherigera 5 × 3 mm. rostro 4 mm. longo labio 6 mm. longo hoc 4 mm. lato, capsula 16 mm. longa hac 6 mm. lata, seminibus 2·5 mm. longis 1 mm. latis.

Plate 12. A; figs. 1—7.—Pedicularis lachnoglossa *Hook. f.*

Specimen from Pat-ze-la.

This account of *P. lachnoglossa* is based on the examination of 35 specimens. The corolla is usually red or purple; in one gathering, however, that from Koo-ma-py-a (*Herb. Calcutt.* n. 618), it is noted in the field as dirty yellowish white. It has no near ally

among Indian species, the nearest being a group of American species, of one of which (*P. Parryi*) it exactly repeats the habit and foliage.

46. **Pedicularis trichoglossa** *Hook. f.* (1884).

Elata hirsuta vel pilosa rhizomate altius subterraneo horizontali magnopere crassato ex apice rotundato ramos plures filicaules sursum sensim crassescentes emmittente flagellis singulis simplicibus collo radicibus fibrosis brevibus dense cæspitosis cincto caule simplice erecto stricto striato-terete dense polyphyllo foliis radicalibus caulinisque imis mox emarcidis evanidisve sessilibus basi auriculatis lineari-oblongis pinnatifidis segmentis 16—20-jugis ovato-oblongis obtusis mucronato-dentatis contiguis floribus breve pedicellatis spica laxiuscula stricta sæpius intervallo distincto parte caulis foliosa remota dispositis bracteis lineari-oblongis acutis apice serratis inferioribus florem æquantibus summis calyce brevioribus calycis hirsuti subcoriacei campanulati 5-secti segmentis supparibus oblongo-lanceolatis lanceolatis vel lineari-lanceolatis apice subacutis margine serrato-dentatis corollæ tubo calyce breviore medio inter dentes inferiores antice inclinato labio 3-secto coriaceo multo quam longo latiore lobis reniformibus subæquimagnis galea inflata circinnata dorso villo longo rubiginoso dense obtecto parte basali recta tubo æquilata fere horizontali parte antherigera falcata deorsum directa in rostrum circinnatum deflexum apice integerrimo spathulato subreflexo sensim producta staminibus ex adverso summi ovarii insertis filamentis ad insertionem parce barbatis ceterum glaberrimis ovario ovato stylo longissime exserto capsula ovata compressa acuta parum exserta seminibus majusculis testa rugosis pallidis perforate reticulatis.—P. trichoglossa *Hook. f.*, *Flor. Brit. Ind.* iv, 310; *Maxim.*, *Mel. Biol.* xii, 842, *t.* 3, *f.* 55.

In Himalaya occidentali:—Kamaon; supra Nabbi, 12—13,000 p. s. m.; in valle Kutti et supra Nepalcha, 13,000 p. s. m.; sub tegmine betularum in valle eadem; prope Bidang, 14—15,000 p. s. m. et prope Rama, 12—13,000 p. s. m., in valle Dhauli; in Mulapa Gadh, ad glaciem, 12,000 p. s. m., *Duthie!* Nepal occidentali; in Nampa Gadh, 12—13,000 p. s. m., et ex pagi Budhi adverso, 11—12,000 p. s. m. in umbrosis betulaceis, *Duthie!* In Himalaya orientali:—Sikkim; ad Wallanchoon, apud Momay et Tungu, 12—13,000 p. s. m., *Hooker;* in Sochu, supra Tungu, 13,000 p. s. m., *Kingii mercenar.!* ad Zey-lep-la, 14,000 p. s. m., ad ripas humidas rivulorum, *Pantling!* In Patong-la, *Kingii mercenar.!* Chumbi; apud Perm-la, prope Chum-la-ree; ad Kapoop, *Kingii mercenar.!* Phari; ad Do-tho; apud Sham-chen, et ad Goop, *Kingii mercenar.!*

Julio—Augusto floret; corolla purpurea.

Caulibus 12—90 cm. altis, rhizomatis cactoidei extus crustacei parte quæ superstit 10 cm. longa 2—3 cm. crassa, flagellis subterraneis lucem quærentibus gracillimis 6—12 cm. longis, foliis 6—8 cm. longis 0·75 cm. latis segmentis 4 × 2—3 mm., pedicellis 2—3 mm. calyce 14 mm. longo hoc 6 mm. lato corollæ tubo 12 mm. longo galea parte basali 5 mm. longa hac 3 mm. lata parte antherigera 7 mm. longa 4·5 mm. lata rostro 6 mm. longo labio 16 mm. lato, capsula 15 mm. longa 8 mm. lata seminibus 2·5 mm. longis 1·5 mm. latis.

Plate 12. B; figs. 8—15.—Pedicularis trichoglossa *Hook. f.*

Specimen from Patong-la.

This account of *P. trichoglossa* is founded on an examination of 54 specimens. The species is most nearly allied to *P. rhodotricha*. The diagnosis is as follows:—

beak slender, deflexed, apex entire; margin of lip glabrous . . . *P. trichoglossa*;
beak conical, falcate, apex 2-fid; margin of lip ciliate . . . . . *P. rhodotricha*.

47. Pedicularis Clarkei *Hook. f.* (1884).

Elata hirsuta vel pilosa rhizomate altius subterraneo incrassato ex apice pyramidali ramos plures sursum sensim crassescentes emittente flagellis singulis simplicibus collo radicibus fibrosis brevibus dense cæspitosis cincto caule simplice erecto stricto striato-terete fistuloso dense polyphyllo foliis radicalibus caulinisque imis mox evanidis sessilibus basi auriculatis lineari-oblongis pinnatisectis rhachi alatis segmentis 15—25-jugis sæpius distantibus ovato-oblongis acutis mucronato-dentatis floribus breve pedicellatis spica condensata stricta parte caulis foliosa continua dispositis bracteis lineari-oblongis acutis apice serratis inferioribus flore longioribus summis calyce brevioribus calycis hirsuti membranacei campanulati 5-dentati segmentis supparibus postico deltoideo integro reliquis lanceolatis duplicato-serratis corollæ tubo fere recto calycem parum excedente labio cuneato-obovato antice 3-fido lobis margine ciliatis obovatis æquimagnis cum dente deltoideo subulato inter lobos interjecto galea vix inflata arcuato-incurva parte basali recta tubo æquilata parte antherigera leviter falcata fere horizontali vertice parce pilosa in rostrum conicum rectum apice segmentis sinuatis 2-fidum sensim attenuata staminibus ex adverso summi ovarii insertis ad insertionem parce villosulis ceterum glaberrimis ovario ovato stigmate exserto capsula ovata acutiuscula parum exserta seminibus majusculis testa rugosis pallidis perforate reticulatis.—P. Clarkei *Hook. f., Flor. Brit. Ind.* iv., 310; *Maxim., Mel. Biol.* xii, 840, *t.* 3, *f.* 60.

In Himalaya orientali:—Sikkim; Yeumtong et Tungu, 12—13,000 p. s. m., *Hooker!* Phullaloong, 13,000 p. s. m., *Thomson!* Aloktong, 13,000—15,000 p. s. m., *Anderson!* Jongri, 13,000 p. s. m., *Clarke!* Tang-ka-la, *Kingii mercenar.!* Chumbi; ad Pun-ka-bee-see-mo, *Kingii mercenar.!* Phari; ad Sham-dhu, *Kingii mercenar.!* Nepal orientali; ad Bloktan, 12,000 p. s. m., et ad Kogling prope Kangla, 14,000 p. s. m., *Kingii mercenar.!*

Julio, Augusto, Septembre floret; corolla sæpissime punicea, nonnunquam tamen albo-punctata.

Caulibus 25—80 cm. altis nonnunquam minimi digiti crassitudine, rhizomatis cactoidei extus crustacei parte quæ superstit ultra 7 cm. longa 1—1·5 cm. crassa flagellis subterraneis lucem quærentibus 4—5 cm. longis, foliis 4—6 cm. longis, his 0·75—1·25 cm. latis segmentis 4—7 × 2·5 mm., pedicellis 2—3 mm., calyce 15 mm. longo 5 mm. lato, corollæ tubo 16—18 mm. longo galea parte basali 4·5 × 2·5 mm., parte antherigera 6·5 × 3 mm. rostro 5 mm. longo labio 13 mm. longo hoc 9 mm. lato, capsula 16 mm. longa hac 8 mm. lata seminibus 2·5 mm. longis his 1·5 mm. latis.

Plate 11. A; figs. 1—7.—Pedicularis Clarkei *Hook. f.*

Specimen from Tang-ka-la,—north of Ze-lep-la and at the same elevation.

This account of *P. Clarkei* is based on an examination of 37 specimens. The species repeats the habit and foliage with the calyx, corolla tube, and lip of *P. Prainiana*, *P. Prainiana* differs in having a beakless hood.

48. **Pedicularis Prainiana** *Maxim.* (1888).

Elata hirsuta rhizomate ipso non viso (fere certe rhizomatibus *P. trichoglossæ* et *P. Clarkei* invenietur simillima) flagelli subterranei parte summa manente gracili collo radicibus fibrosis brevibus dense cæspitosis cincto caule simplice erecto stricto striato-terete fistuloso dense polyphyllo foliis radicalibus caulinisque imis mox evandis sessilibus basi auriculatis lineari-oblongis pinnatisectis rhachi alatis segmentis 15—25-jugis distantibus ovato-oblongis acutis mucronato-dentatis floribus breve pedicellatis spica condensata stricta parte caulis foliosa continua dispositis bracteis lineari-oblongis acutis apice serratis inferioribus flore longioribus summis calyce brevioribus calycis hirsuti membranacei campanulati 5-dentati segmentis supparibus postico deltoideo integro reliquis lanceolatis duplicato-serratis corollæ tubo cum galea arcuato-incurva calycem parum excedente labio cuneato-obovato antice 3-fido lobis margine ciliatis obovatis æquimagnis cum dente umbonato inter lobos interjecto galea naviculari dorso parce pilosa parte basali tubo æquilata eoque continua parte antherigera fronte rotundata antice latius aperta erostri staminibus medio tubo insertis filamentis glaberrimis ovario ovoideo stigmate parum exserto.—P. Prainiana *Maxim.*, *Mel. Biol.* xii, 844, *t.* 3, *f.* 66; *Prain in Jour. As. Soc. Beng.* lviii, 2, 277.—P. rudis *Prain in sched.* (*ex Herb. Calcutt. distrib.* 1885), *nec Maxim.*

In Himalaya orientali:—Chumbi, apud Lu-ma-poo, *Kingii mercenar.* (n. 509)!

Julio floret; corolla lutea.

Caulibus 45 cm. altis, foliis 7—10 cm. longis 1·5—2 cm. latis segmentis 6—7 × 4—6 mm. pedicellis 2—3 mm. calyce 16 mm. longo 5 mm. lato, corollæ tubo 17 mm. longo galea parte basali 5 × 3 mm. parte antherigera 8 × 5 mm., labio 10 mm. longo 6 mm. lato.

Plate 11. B; figs. 8—11.—Pedicularis Prainiana *Maxim.*

Specimen from Lu-ma-poo, Chumbi.

There is only one gathering of this species. The plant exactly repeats the habit and foliage of *P. Clarkei;* as regards corolla it is closely allied to *P. rudis*, for which it was at first taken. It is, however, as Mr. Maximowicz has shown, perfectly distinct; the diagnosis is as follows:—

corolla tube glabrous, galea dilated in front with sides villous, lip narrowly cuneate-obovate 3-fid shorter than galea with lobes obovate . . . . *P. Prainiana;*

corolla tube puberulous, galea equally wide throughout with margin villous, lip broadly ovate 3-lobed equalling the galea with lobes rounded . . . . . *P. rudis.*

49. **Pedicularis Gammieana** *Prain* (1889).

Humilis hirsuta rhizomate tenui caulibus gracilibus arcuatis paucis foliis radicalibus nullis caulinis petiolatis parvulis verticillatis verticillis (2) 4-ternis vel verticillo inferiore paribus 2 oppositis decussatim intervallo separatis 2-pinnatipartitis segmentis 2-jugis laciniis ovato-oblongis profunde incisis floribus paucis axillaribus breve pedicellatis confertis bracteis foliiformibus petiolatis calycis campanulati hirsuti antice triente fissi 5-dentati segmento postico lanceolato integro reliquis e basi attenuata in laminam ellipticam profunde acute inciso-dentatam dilatatis corollæ tubo calycem duplo superante labio 3-lobato lobis rotundatis lateralibus medio duplo majoribus galea inflata arcuato-incurva

parte basali tubo parum latiore erecta parte antherigera falcata in rostrum breve conicum apice emarginato abrupte producta staminibus medio tubo insertis filamentis anticis superne barbatis ovario ovoideo-lanceolato stigmate exserto.—P. Gammieana *Prain in Jour. As. Soc. Beng.* lviii, 2, 260.

In Himalaya orientali:—Sikkim; ad Lang-mang nang-zo, 10,000 p. s. m., *Pantling!* Maio floret; corolla saturate purpurea.

Caulibus 6—8 cm. altis, petiolis 6—16 mm. longis laminis 12 × 6 mm. segmentis 6 × 3 mm. et 2—6 mm. remotis, pedicellis 2—3 mm., calyce 7 mm. longo, corollæ tubo 16 mm. longo galea parte basali 6 × 2·5 mm. parte antherigera 6 × 3 mm. rostro 3·5 mm. longo labio 12 mm. lato.

Plate 22. C; figs. 16—20.—Pedicularis Gammieana *Prain.*

Specimen from the solitary gathering.

The material of this species is not very adequate, but it is impossible to associate it with any of the known species of the genus. The corolla differs from that of *P. binaria* only in having the lower lip ciliate and the central lobe of the lip less depressed; the habit and foliage of *P. binaria* are, however, so very dissimilar that it is impossible to unite it with that species. It is not unlike a dwarfed condition of *P. flexuosa* with whorled instead of opposite and with much more incised leaves; it has, however, a deflexed and more deeply emarginate beak; the calyx, besides, is very different. The species that it most closely resembles is *P. odontophora*, from which it is, however, at once diagnosed by the absence of teeth on the corolla throat and by the leaves being whorled and not alternate. It is peculiar among Indian species in its time of flowering, almost the only other species collected so early in the year being *P. siphonantha.*

50. Pedicularis schizorrhyncha *Prain* (1889).

Nana cæspitosa glabra rhizomate nodoso radicibus cæspitosis fusiformibus fibrosisve caulibus numerosis gracillimis brevibus debilibus foliis radicalibus densissime cæspitosis caulinis 1-paribus oppositis vel 0 omnibus longe petiolatis lanceolatis pinnatisectis segmentis 6—8-jugis ovatis subdistantibus serrato-dentatis racemis sæpissime 3-floris rarius 4-floris floribus breve pedicellatis bracteis foliaceis calycis oblongi nervis pubescentibus antice vix fissi 5-dentati dente postico lanceolato reliquis oblongis omnibus apice cristatis corollæ tubo calyce duplo longiore labio 3-partito margine ciliato lobis rotundatis lateralibus medio dimidio majoribus galea inflata arcuato-incurva parte basali tubo æquilata erecta parte antherigera falcata margine 2-auriculata auriculis nonnunquam in dentes subulato-lineares excurrentibus antice in rostrum porrectum leviter deflexum breve conicum apice truncatum margine laciniatum educta staminibus medio inter summum ovarium et apicem tubi insertis filamentis anticis hirsutis ovario ovoideo stigmate exserto capsula ovata apiculata parum exserta seminibus subtriquetris nigris minutissime reticulatis.—P. schizorrhyncha *Prain in Jour. As. Soc. Beng.* lviii, 2, 260.

In Himalaya orientali:—Sikkim, *Jaffrey!* Kan-ker-teng, 13,000 p. s. m.; Bijan, 12,000 p. s. m., *Kingii mercenar.!* Chumbi; ad Tan-ka-la, *Kingii mercenar.!*

Augusto—Septembre floret; corolla punicea.

Caulibus 3—5 cm. altis, radicibus 4—5 cm. longis, petiolis radicalibus caulinisque 2 cm. longis floralibus vix 5 cm. longis laminis 9 × 3—4 mm. segmentis 1—2 × 1 mm.,

pedicellis 2—3 mm., calyce 9 mm. longo 4 mm. lato, corollæ tubo 16—18 mm. longo galea parte erecta 5 × 2·5 mm. parte antherigera 7 × 4·5 mm. rostro 3 mm. longo labio 17 mm. lato, capsula 11 × 6 mm. seminibus 1·25 mm. longis.

Plate 25. C; figs. 13—19.—Pedicularis schizorrhyncha *Prain*.

Specimen from Sikkim (Jaffrey).

The account of *P. schizorrhyncha* is based on an examination of 73 specimens. This species repeats the habit and foliage of *P. chumbica*, to which, however, it is not very closely related; the diagnosis has been already given. This seems an opposite-leaved *Rostrata* rather than a truly *Orthorrhynchous* species.

51. **Pedicularis alaschanica** *Maxim.* (1877).

Humilis vel elatior e basi ramosa villosa rhizomate crasso lignoso caulibus teretibus apice ascendentibus foliis quaternatim verticillatis oppositisve petiolatis pinnatisectis segmentis 8—12-jugis lanceolatis decurrentibus distantibus serratis floribus sessilibus spicis interruptis verticillastris 4-floris dispositis bracteis inferioribus totis foliaceis reliquis basi integris membranaceis ovatis apice foliaceis pinnatilobis serratisve calycis membranacei ovoidei hirsuti 5-dentati segmento postico deltoideo reliquis lanceolatis acutis dimidio breviore corollæ tubo calyce æquilongo labio rotundato antice 3-lobo lobis lateralibus ovatis medio orbiculato multo majoribus galea inflata arcuato-incurva parte basali erecta fauce 2-sinuata margine glandulose incrassato parte antherigera subfalcata in rostrum anguste conicum porrectum apice integro truncatum producta staminibus ex adverso summi ovarii insertis filamentis anticis hirsutis ovario ovoideo stigmate subexserto capsula late ovata acuminata parum exserta seminibus majusculis ovatis testa pallidis rugosis profunde reticulatis.

Var. *typica;* elatior foliis 4-ternis calyce margine et ad costas hirsuto dente postico margine integro reliquis serratis rostro galeæ latitudinem æquante apice leviter sinuato.—P. alaschanica *Maxim.*, *Mel. Biol.* x, 91 et xii, 860, *t.* 5, *f.* 86*a*; *Prain in Jour. As. Soc. Beng.* lviii, 2, 261.

In Himalaya orientali:—Phari; *Kingii mercenar.!*
Distrib.—Mongolia; in alpibus Alaschan. China; Kansu orientali et boreali.

Var. *tibetica;* humilis foliis oppositis vel rarius 3-natim verticillatis calyce dense villoso dentibus omnibus margine integris rostro galeæ longitudine manifeste breviore.—P. alaschanica var. tibetica *Maxim.*, *Mel. Biol.* xii, 860, *t.* 5, *f.* 86*b*; *Prain in Jour. As. Soc. Beng.* lviii, 2, 261.

In Himalaya orientali:—Phari; apud Do-tho, *Kingii mercenar.!*
Distrib.—Tibet bor.-orient.; in valle Assak-gol.
Augusto floret; corolla lutea.

Caulibus var. *typicæ* 15—20 cm. longis var. *tibeticæ* 5—8 cm., rhizomate 5—6 cm. longo petiolis 1·5—2 cm., laminis 2—2·5 × 0·5—0·75 cm. segmentis 3—4 × 1 mm. calyce 11 mm. longo hoc 5 mm. lato corollæ tubo 11 mm. longo galea parte basali 4 × 2 mm. parte antherigera 5 × 3 mm. rostro var. *typicæ* 3 mm. longo var. *tibeticæ* vix 1 mm. longo labio 10 mm. lato, capsula 11 mm. longa seminibus 3 mm. longis 1·75 mm. latis.

PLATE 25. A, B; figs. 1—12.—Pedicularis alaschanica *Maxim.*

A—Specimen of VAR. *typica* from Phari (Lama Ujyen Gyatsko n. 45).
B— ,, ,, *tibetica* from Do-tho.

This account of *P. alaschanica* is, as regards VAR. *typica*, based on the examination of one Chinese specimen (E. Kansu, *Potanin;* 1885, kindly sent by Mr. Maximowicz) and 10 specimens from Phari—all gathered by the Lama Ujyen Gyatsko. Mr. Maximowicz describes the filaments as glabrous in the Alaschan specimens, but in the Chinese one and in all those from Phari, of both varieties, the anterior filaments are hirsute. The specimens, of which one has been figured, here treated as examples of VAR. *typica* are, as regards calyx, clearly referable to that variety, but as regards beak are intermediate between the two varieties recognised by Maximowicz. With a more extensive suite of specimens from Southern Tibet, it may become necessary to merge the varieties in one. The species has no near Indian ally, the nearest species being the Siberian *P. myriophylla*, the Chinese *P. curvituba*, and the Japanese *P. Chamissonis*. Of VAR. *tibetica* proper I have examined 6 specimens, all of one gathering.

§§§§ BIDENTATÆ Maxim.

Folia opposita vel verticillata:—
galea infra apicem utrinque 3-dentata . . . . . 52. *P. lyrata.*
galea infra apicem utrinque 1-dentata:—
filamentis anticis hirsutis, foliis subsessilibus nec basi connatis 53. *P. comptoniifolia.*
filamentis omnibus hirsutis foliis bracteisque basi in vaginas perfoliatas connatis . . . . . 54. *P. rex.*
Folia sparsa, galea infra apicem 1-dentata, filamentis anticis hirsutis . . 55. *P. dolichorrhiza.*

52. Pedicularis lyrata *Prain* (1888).

Humilis subacaulis pubescens simplex vel pluriceps rhizomate tenui lignoso radicibus fibrosis ramosis foliis oppositis subcordato-ovatis obtusis grandicrenatis denticulatisque radicalibus breve petiolatis caulinis subsessilibus floribus laxe racemosis breve pedicellatis bracteis foliaceis basi dilatatis sessilibus calycis tubulosi hirsuti profunde 5-dentati segmentis summo subulato integro reliquis e basi angustiore integra breve ellipticis parce dentatis corollæ tubo recto sursum parum ampliato intus glandulose ciliato calycem dimidio superante labio 2-plicato antice 3-lobo lobis subæquilatis rotundatis margine eroso-crenulatis medio prominulo emarginato galea arcuate incurva parte basali erecta parte antherigera subfalcata apice angulatim cucullata deorsum breve producta et infra apicem segmentis utrinque 3-dentatis bifida dente inferiore subulato reliquis deltoideis staminibus ex adverso summi ovarii insertis filamentis glabris ovario lanceolato acuto stigmate incluso disco antice ovoideo incrassato capsula oblongo-lanceolata acuta calyce fere duplo longiore seminibus parvulis ovoideis testa rubro-fuscis distincte reticulatis.—P. lyrata *Prain, Maxim., Mel. Biol.* xii, 900, *t.* 4, *f.* 135; *Jour. As. Soc. Beng.* lviii, 2, 265.

In HIMALAYA orientali:—Phari; et ad Ting, *Kingii mercenar.!*

Julio et Augusto floret; corolla alba.

Caulibus 0—6 cm. altis rhizomate 2—5 cm. longo, radicibus 1—3 cm. longis petiolis radicalibus 1—1·5 cm. caulinis 0·25—0·5 cm. laminis 2 × 1 cm. segmentis 2—3 × 3 mm., calyce 7 mm. longo hoc 2·5 mm. lato corollæ tubo 12 mm. longo galea parte basali 5 × 2 mm. parte antherigera 4 × 2 mm. labio 7 × 4·5 mm. capsula 14 × 5 mm. seminibus 1·25 mm. longis.

PLATE 31. B; figs. 7—13.—Pedicularis lyrata *Prain.*

Specimen from Ting.

The description of this species is based on an examination of 11 specimens. Its nearest ally is *P. lutescens*, a Yunnan species, which differs by its shorter corolla tube, its 5-fid galea teeth, and its disc prolonged anteriorly into a spur.

53. Pedicularis comptoniæfolia *Franchet* (1888).

Elata superne breviter ramosa glabrata caule terete stricto foliis coriaceis 4-natim verticillatis brevissime petiolatis lanceolatis acuminatis pinnatilobis segmentis 10—14-jugis rotundatis cartilagineo-denticulatis floribus subsessilibus versus apices caulis ramorumque spicatis spicis interruptis plurifloris bracteis foliaceis mucronato-serrulatis calycem superantibus calycis campanulati inflati chartacei brevissime 5-dentati segmentis deltoideis inæqualibus integris margine villosis corollæ tubo ad calycis faucem incurvo sursum ampliato calycem plus duplo superante labio obovato margine subcrenulato antice 3-lobo lobo medio prominulo rotundato lateralibus ovatis dimidio minore galea parum arcuata tubo subcontinua eique æquilata fronte inclinata in rostrum brevissimum latum oblique truncatum utrinque 1-dentatum abeunte staminibus ex adverso summi ovarii insertis filamentis basi villosulis anticis etiam superne parce barbatis ovario ovato stigmate exserto capsula late ovata parum exserta seminibus ovoideis cinereis distincte reticulatis.—P. comptoniæfolia *Franchet, Maxim., Mel. Biol.* xii, 871, *t.* 5, *f.* 96; *Prain, Jour. As. Soc. Beng.* lviii, 2, 265.

In BURMA:—in mont. Shan, apud castra "Fort Stedman" nuncupata, 6,000 p. s. m., *Collett* (n. 911)!

DISTRIB.—Yunnan.

Novembri floret; corolla purpurea.

Caulibus ultra 80 cm. altis, petiolis 1—3 mm. laminis 3—5 × 0·5—0·75 cm. segmentis 2·5 × 3 mm. spicis 12—20 cm. calyce 6 mm. longo hoc 3·5 mm. lato corollæ tubo 15 mm. longo galea 7·5 mm. longa 3 mm. lata labio 10 mm. longo hoc 8 mm. lato, capsula 8·5 × 6·5 mm. seminibus 2 mm. longis.

PLATE 15. B; figs. 6—11.—Pedicularis comptoniæfolia *Franchet.*

Specimen from Fort Stedman, Shan Hills (Collett n. 911).

This description is from three specimens collected by General Collett, C.B., in 1888. They differ from the Yunnan plant named by Franchet and described by Maximowicz in having shorter leaves, and especially in not having the midlobe of the lower lip emarginate; in other respects they appear to agree exactly.

54. Pedicularis rex *Clarke* (1888).

Elata glabra rhizomate incrassato caule erecto stricto crasso tetragono subalato simplice vel superne fastigiatim parce ramoso foliis radicalibus sub anthesi emarcidis caulinis 4-natim et decussatim verticillatis petiolatis petiolis inferiorum basi dilatais summorum alatis et in vaginam campanulatam perfoliatam connatis laminis ellipticis pinnatisectis rachi alatis segmentis 13—17-jugis distantibus lanceolatis acutis pinnatifidis laciniis argute dentatis floribus subsessilibus laxe spicatis verticillastris 4-floris intervallo distincto remotis bracteis foliaceis 4-natim verticillatis basi in tubum membranaceum calyces superantem connatis calycis tenuis membranacei ventre fissi dorso semibifidi laciniis æqualibus latissime ovatis apice ipso nunc integro nunc 2- vel 3-dentato corollæ tubo recto calycem plus duplo superante medio intus glanduloso-ciliato labio rotundato valide 2-plicato antice 3-lobo lobo medio prominulo cucullato transverse late ovali lateralibus semirotundis multo minoribus galea subrecta tubo subcontinua parte basali parum inclinata parte antherigera suberostri ante apicem subulato-bidentata staminibus ex adverso summi ovarii insertis filamentis omnibus superne villosis ovario ovato stigmate incluso disco antice in cornu ovarium subæquans producto capsula subrhomboidea vix exserta seminibus nigris ellipticis utrinque apiculatis minute reticulatis.—P. rex *Clarke*, *Maxim.*, *Mel. Biol.* xii, 875, *t.* 5, *f.* 103; *Prain*, *Jour. As. Soc. Beng.* lviii, 2, 266.

In Assam:—in mont. Khasia; apud Shillong, 5—6,000 p. s. m., *Mann! Clarke;* in Burma; *Brandis!*

Distrib.—Yunnan; Kwei-tschow.

Junio floret; corolla lutea.

Caulibus 40—120 cm. altis, petiolis 1—2 cm. laminis 5—7 × 2—3 cm. segmentis 15 × 6 mm., spicis 8—30 cm. longis, verticillastris 30 mm. remotis, vaginis 10—12 mm. altis, calyce 9 mm. longo hoc 4 mm. lato, corollæ tubo 24 mm. longo galea 16 mm. longa hac 6 mm. lata labio 9 mm. longo hoc 7·5 mm. lato, capsula 18 mm. longa hac 13 mm. lata seminibus 3 mm. longis.

Plate 30. A; figs. 1—8.—Pedicularis rex *Clarke*.

Specimen from Burma.

This description is founded on the examination of 23 specimens. This fine species is most nearly allied to *P. superba*, in which also the flowers are sheathed by connivent bracts, but which has a very different calyx and corolla.

55. Pedicularis dolichorrhiza *Schrenk* (1841).

Elata hirsuta rhizomate incrassato collo squamis magnis late ovatis tenuibus membranaceis vestito caule simplice stricto terete fistuloso foliis radicalibus numerosis longe petiolatis caulinis sursum decrescentibus subsessilibus pinnatisectis segmentis 15—25-jugis lanceolatis pinnatipartitis lobis cartilagineis mucronato-serratis floribus laxius spicatis sessilibus bracteis inferioribus foliaceis summis trifidis lacinia media lanceolata margine serrulata lateralibus dentiformibus calycis villosi campanulati membranacei 5-dentati segmentis deltoideis lanceolatis vel subulatis acutis postico integro reliquis margine minutissime serrulatis corollæ tubo calycem vix excedente labio 2-plicato basi intus

ciliato antice 3-lobo lobis obovatis lateralibus medio dimidio majoribus galea curvata breviore galea adunca parte basali tubo continua parte antherigera in rostrum conicum apice bifidum segmentis deltoideis staminibus ex adverso medii ovarii insertis filamentis insertione villosulis anticis superne sparse barbatis ovario ovato-lanceolato stigmate exserto capsula ovata acuminata calyce dimidio longiore seminibus longe ovatis appendiculatis testa subrutilis distincte reticulatis.—P. dolichorrhiza *Schrenk, Fisch. et Mey., Enum. Pl. Nov.* ii, 23; *Bunge, Bull. Phys. Math. Petersb.* i, 379; *Walp., Rep.* iii, 426; *Benth., DC. Prodr.* x, 570; *Bunge, Ledeb., Flor. Ross.* iii, 291; *Maxim., Mel. Biol.* x, 117; *Regel, Acta Hort. Petrop.* vi, 352; *Maxim., Mel. Biol.* xii, 905, *t.* 6, *f.* 146; *Prain, Jour. As. Soc. Beng.* lviii, 2, 275.—P. cabulica *Benth., DC. Prodr.* x, 575 (1846); *Maxim., Mel. Biol.* xii, 855, *t.* 4, *f.* 80.—P. fissa *Hook. f., Flor. Brit. Ind.* iv, 316 (1884), *nec Turcz.*

In Himalaya occidentali:—Kashmir; ad Dras, 10—11,000 p. s. m., *Henderson!* inter Baltal et Dras, transitu Zoji-la, *Henderson;* prope Iskardo, *Falconer*, (in Herb. Saharanpur)! Gilgit, *Tanner* (n. 256)! hæc spp. omnia cum planta Schrenkiana omnino consentanea. Afghanistan:—in graminosis Kurzar, *Griffith* (Journ. n. 1143)! sp. typicum *P. cabulicæ.* Gilgit; apud Sai, 10,000, *Tanner!* Hindu Kush, *Griffith* (n. 3941 Kew distrib.)! *Giles* (ter)! hæc omnia inter *P. dolichorrhizam* genuinam et *P. cabulicam* mediantia.

Distrib.—Turkestania; Mongolia boreali; Tibet boreali.

Corolla ochroleuca; Augusto—Septembre floret.

Caulibus 20—90 cm. altis, petiolis radicalibus et caulinis imis 10—15 cm. longis laminis 15 × 3 cm., segmentis 15 mm. × 4 mm., calyce 12—13 mm. longo hoc 5 mm. lato, corollæ tubo 16 mm. longo galea parte basali 6 × 3·5 mm. parte antherigera 8 × 5 mm. rostro 3 mm. longo labio 11 mm. lato, capsula 15—18 mm. longa hac 8 mm. lata seminibus 2 mm. longis.

Plate 30. B; figs. 9—14.—Pedicularis dolichorrhiza *Schrenk.*

Specimen from Sai, Gilgit.

This account of *P. dolichorrhiza* is based on an examination of 21 specimens. Dr. Henderson's specimen has precisely the calyx and corolla of Mr. A. Regel's specimens from Sairam in Turkestan; Regel's appears to be exactly Schrenk's plant. Dr. Falconer's gathering from Iskardo and one of Colonel Tanner's gatherings from Gilgit are the same thing. All Dr. Giles' specimens and Dr. Griffith's Hindu Kush gathering (Jour. n. 157), with the gathering by Colonel Tanner at Sai which has been figured, agree with each other in every respect and differ from the genuine plant only in having the capsule one-half in place of one-third longer than the calyx. "*P. cabulica*," which is Dr. Griffith's plant from Kurzar, has a corolla indistinguishable from the Hindu Kush plant, and has the same longer capsule; its calyx has, however, subulate teeth. As this is the only character by which its separation may be effected from *P. dolichorrhiza*, it seems inadvisable to treat it even as a variety.

DIVISIO III.—EROSTRES Prain.

§§§§§ Anodontæ Bunge.

Floribus axillaribus, longissime pedicellatis; foliis cæspitosis; planta nana acaulis . . . . . 56. *P. Regeliana.*

Floribus spicatis; caulibus distinctis:—
foliis verticillatis vel oppositis; floribus centripeto ordine apertis:—
tubo corollæ infracto:—
tubo intra calycem infracto:—
labio lobis æquilatis:—
galea fronte decliva . . . . . 57. *P. glolifera.*
galea fronte truncata . . . . . 58. *P. cheilanthifolia.*
labio lobo medio lateralibus minore:—
galea acuminata labium distincte superante . 59. *P. ophiocephala.*
galea labio manifeste breviore . . . . . 60. *P. Reylei.*
tubo apice ipso infracto:—
labio margine eciliato:—
filamentis anticis hirsutis . . . . . 61. *P. gibbera.*
filamentis omnibus glabris. . . . . 62. *P. polygaloides.*
filamentis omnibus hirsutis . . . . . 63. *P. denudata.*
labio margine ciliato . . . . . 64. *P. mollis.*
tubo corollæ recto:—
labio lobis supparibus . . . . . 65. *P. collata.*
labio lobo medio lateralia excedente:—
labio margine ciliato . . . . . 66. *P. fragilis.*
labio margine eciliato . . . . . 67. *P. Kingii.*
tubo corollæ incurvo (haud infracto) . . . . . 68. *P. pycnantha.*
foliis sparsis, floribus centrifugo ordine apertis . . . . . 69. *P. Oederi.*

56. **Pedicularis Regeliana** *Prain* (1889).

Nana acaulis rhizomate incrassato collo paucisquamato stolona brevia flagellifera emittente foliis cæspitosis petiolatis pinnatisectis segmentis 4—7-jugis ovato-rotundatis basi angustatis serrato-dentatis floribus paucis axillaribus longissime crassius pedicellatis calycis cylindrico-campanulati costis hirsuti antice triente fissi 5-dentati segmentis ovatis serratis inæqualibus postico lateralibus triplo anticisque duplo minore corollæ tubo sursum ampliato calycem duplo excedente labio 3-fido lobis rotundatis leviter emarginatis lateralibus medio dimidio majoribus galea inflata arcuato-incurva parte basali tubo angustiore parum inclinata parte antherigera falcata apice cucullata fauce utrinque 1-dentata dentibus deorsum directis dorso leviter cristata staminibus medio inter summum ovarium et tubi apicem insertis filamentis omnibus (anticis densioribus) hirsutis ovario ovato stigmate exserto capsula ovato-acuta basi angustata triente exserta seminibus paucioribus anguste ovoideis cinerascentibus striatis vix reticulatis.—P. Regeliana *Prain, Jour. As. Soc. Beng.* lviii, 2, 274.

In Himalaya orientali:—Sikkim; ad Ze-lep-la, Tang-ka-la et Phu-la-loong, 12—13,000 p. s. m.; Jongri; apud Tha-moo-tsa, ad Bijan, et ad Kan-ker-teng, 11—12,000 p. s. m., *Kingii mercenar.!*

Augusto floret; corolla concolor purpurea.

Stolonibus 0—3 cm. longis, foliorum petiolis 1—6 cm. laminis 0·75—6 cm. longis 0·5—1·5 cm. latis segmentis 2—5 mm. iis rhizomati propioribus petiolulis distinctis, pedicellis 9—45 mm., calyce 9—11mm. longo, corollæ tubo 15—18mm. longo fauce 5 mm. lata basi duplo latiore galeæ parte basali 2 mm. longa 2 mm. lata parte antherigera 9—11 mm. longa

3 mm. lata rostro 2—3 mm. longo labio 17 mm. lato, capsula 17—20 mm. longa hac 6·5 mm. lata seminibus 2 mm. longis.

PLATE 10. C; figs. 11—17.—Pedicularis Regeliana *Prain.*

Specimen from Phu-la-loong.

This description is based on an examination of 105 specimens. The species is not closely allied to any Indian one, the nearest species being the European *P. acaulis* and the Northern Chinese *P. Artselœri.* From both it is at once distinguished by its much longer capsules. *P. Artselœri* has been noted as tinging the paper in which specimens are dried with purple; the same thing happens with *P. Regeliana.* The only other Indian *Pedicularis* that appears to do so is *P. megalantha* VAR. *pauciflora.*

57. **Pedicularis globifera** *Hook. f.* (1884).

Nana vel humilis nonnunquam tamen elatior parce pubescens vel glabrata rhizomate incrassato collo pluricipite squamis lanceolatis paucis vestito radicibus fusiformibus carnosis caulibus cæspitosis simplicibus vel e basi ramosis foliis radicalibus longe petiolatis dense cæspitosis caulinis breve petiolatis verticillis (1—2) 4-ternis pinnatisectis segmentis 10—18-jugis lanceolatis linearibusve cartilagineo-dentatis floribus subsessilibus verticillatis dense confertis vel inferioribus distantibus bracteis inferioribus foliaceis summis ovatis lanceolatis pinnatisectis calyce brevioribus calycis oblongo-campanulati costis dense hirsuti antice triente fissi 5-dentati segmentis inæquilatis summo deltoideo integro vicinis cristatis duplo angustiore anticis etiam cristatis æquilato corollæ tubo supra basin infracto sursum ampliato calycem plus dimidio superante labio dupio latiore quam longo 3-lobo lobis orbiculatis medio lateralibus vix dimidio angustiore galea incurva parte basali erecta tubo continua parte antherigera fronte decliva in rostrum deorsum spectans brevissimum conicum apice rotundatum abeunti staminibus ex adverso medii ovarii insertis filamentis ipso basi minutissime villosulis ceterum glabris ovario ovato lanceolato stigmate exserto capsula ovata lanceolata apice acuta calycem plus dimidio excedente seminibus ovoideis basi appendiculatis testa pallidis distincte reticulatis.—P. globifera *Hook. f., Flor. Brit. Ind.* iv, 308; *Maxim., Mel. Biol.* xii, 869, *t.* 5, *f.* 95.

In HIMALAYA orientali:—Sikkim; *Hooker;* Phari; (sæpissime); et apud Sa-moo-da in Tibet australi, *Kingii mercenar.!* Julio—Augusto floret.

Caulibus 2—25 cm. rhizomate 4—7 cm. longo 0·5—1 cm. crasso radicibus 3—4 cm. longis, petiolis radicalibus 2—5 cm. caulinis 0·5—0·75 cm. laminis 2·5 × 0·75 cm. segmentis 2—3 × 1 mm., calyce 8—9 mm. × 3 5 mm., corollæ tubo 12 mm. longo galea 8 mm. longa rostro 1·5 mm longo labio 6 mm. longo hoc 10 mm. lato, capsula 14 × 5 mm. seminibus 2 mm. longis.

PLATE 32. D; figs. 7—12.—Pedicularis globifera *Hook. f.*

Specimen from Sa-moo-da, 40 miles north of Phari.

This account of *P. globifera* is based on an examination of 49 specimens. The species is very nearly related to *P. cheilanthifolia,* of which it repeats every character except that of curvature of upper lip of corolla. In one gathering from Phari the corolla is noted as white; in the Sa-moo-da gathering it is noted as dark purple; usually it appears to be pale pink. It seems to be the representative in the Eastern Himalaya of *P. cheilanthifolia.*

58. Pedicularis cheilanthifolia *Schrenk* (1841).

Humilis vel elatior parce pubescens vel glabrata rhizomate incrassato collo pluricipite squamis ovatis paucis vestito radicibus fusiformibus carnosis caulibus cæspitosis simplicibus (vel rarissime verticillato-ramosis) foliis radicalibus longe petiolatis dense cæspitosis caulinis breve petiolatis verticillis (1—2) 4-ternis pinnatisectis segmentis 8—12-jugis ovato-lanceolatis linearibusve cartilagineo-dentatis floribus subsessilibus rarissime inferioribus distincte pedicellatis verticillatis dense confertis vel inferioribus distantibus bracteis inferioribus foliaceis summis ovatis lanceolatis pinnatisectis calyce brevioribus calycis oblongo-campanulati costis dense hirsuti antice triente fissi 5-dentati segmentis inæquilatis summo deltoideo integro vicinis cristatis duplo angustiore anticis etiam cristatis æquilato corollæ tubo supra basin infracto sursum ampliato calycem plus dimidio superante labio parum latiore quam longo 3-lobo lobis orbiculatis æquilatis galea arcuata parte basali erecta tubo continua parte antherigera subfalcata in rostrum porrectum brevissimum conicum truncatum abeunti staminibus ex adverso medii ovarii insertis filamentis ipso basi minutissime villosulis ceterum glabris ovario ovato-lanceolato stigmate exserto capsula lanceolata apice acuta calyce 2-plo longiore seminibus ovoideis basi appendiculatis testa pallidis distincte reticulatis.

VAR. *typica;* galea labio manifeste longiore.—P. cheilanthifolia *Schrenk, Fisch. et Mey., Enum. Pl. Nov.* ii, 19; *Walp., Rep.* iii, 939; *Bunge, Ledeb., Flor. Ross.* iii, 273; *Benth., DC. Prodr.* x, 562; *Maxim., Mel. Biol.* x, 89; *Hook. f., Flor. Brit. Ind.* iv, 308; *Maxim., Mel. Biol.* xii, 869.—P. abrotanifolia *Herb. Ind. Or. H. f. & T. T. (nec M. Bieb.).*

In HIMALAYA occidentali:—Chakmanthuru, et Zirkotal, *Falconer!* Kanaor, 18,300 p. s. m., *Jacquemont;* Tibet occident., *reg. alpina,* 11—15,000 p. s. m. *Thomson (Herb. Ind. Or.)!* Lahul et Kanaor, *Hay!* Lahul, *Jaeschke! Watt! Stewart!* Ladak; ad Greinsthal, ad Industhal, et in Pangi, 11—16,500 p. s. m., *Heyde!* ad Terba, atque trans Lanak fl. ad occidentem versus, 15—17,000 p. s. m.; in valle Indus fl. prope Lei (spp. contra normam ramosa ramis 4-natim verticillatis verticillis 2, ramis inferioris 6 cm. summi 4 cm. omnibus floriferis caule apice evidenter animalis cujusdam dente præmorso; ad Ishomoriri; in Kibler atque in ea vicinitate, 14—15,000 p. s. m.; ad Phalung Balda in Ruptschu; in valle Naching ad partem Taklingæ septemtrionalem, 16,000 p. s. m., *Stoliczka!* Gilgit (bis), 13—16,000 p. s. m., *Tanner!* Karakoram, 13,000 p. s. m. (floribus albo-roseis, verticillis distantibus floribus longe pedicellatis, pedicellis inferioribus 9 mm. longis calycem superantibus), *Clarke!*

DISTRIB.—In Soongaria, in Tibet boreali, in Kansu occidentali.

VAR. *isochila;* galea solito paulo latiore labium majus æquante. *Maxim., Mel. Biol.* xii, 869.

In CHINA boreali; Kansu prov. parte orientali, *Potanin!* (sp. ab autore benevolente comm. vidi).

Caulibus 5—22 cm. altis rhizomate 2—5 cm. longo hoc 0·5—1 cm. crasso radicibus 3—4 cm. longis petiolis radicalibus 3—4 cm. caulinis 0·5—0·75 cm. laminis 2·5 × 0·75 cm. segmentis 3—4 × 1 mm. calyce 8—9 × 3·5 mm. corollæ tubo 14 mm. longo galea 10 mm. longa labio VAR. *typicæ* 8 mm. longo hoc 10 mm. lato VAR. *isochilæ* 10 mm.

longo hoc 12 mm. lato, capsula 16 × 5·5 mm. seminibus 2 mm. longis. Julio—Augusto floret ; corolla punicea, rosea vel albo-rosea.

Plate 32. A—C; figs. 1—6.—Pedicularis cheilanthifolia *Schrenk.*

A—Specimen of var. *typica* from north side of Taklinga, in Naching valley, 16,000.

B—Specimen of var. *typica* from Karakoram, 13,000 (Clarke n. 30173).

C— ,, ,, *isochila* from E. Kansu ; kindly communicated by Mr. Maximowicz.

This account of *P. cheilanthifolia* is based on the examination of 34 specimens. The intimate relationship of the species to *P. globifera* has been already noticed. In Stoliczka's specimens from Kibler, in Hay's from Lahul, and in Heyde's from Pangi the inflorescence is centrifugal; in several other gatherings it is subcentrifugal, *i.e.*, the flowers in the lower verticil, removed by an interval from the spike proper, open later than those flowers of the verticils next above which form the base of the congested part of the spike.

59. Pedicularis ophiocephala *Maxim.* (1888).

Humilis cæspitosa rhizomate lignoso nodoso vel elongato collo squamato radicibus cæspitosis fusiformibus caulibus simplicibus 2—4-fariam pilosis gracilibus foliis radicalibus cæspitosis longius petiolatis caulinis verticillatis verticillis (1—2) 2—3-phyllis breve petiolatis lineari-oblongis pinnatipartitis segmentis 6—9-jugis oblongis acutis inciso-serratis floribus subsessilibus verticillis 2—3-floris paucis approximatis vel inferioribus parum distantibus bracteis foliaceis imis distincte petiolatis summis calyce brevioribus calycis pilosi campanulati antice parum fissi 5-dentati segmento summo deltoideo lanceolatove integro reliquis e lata basi lanceolatis usque ad medium dentatis corollæ tubo sursum ampliato calycem distincte excedente basi infracto labio 3-lobo lobis obcordatis emarginatis lateralibus medio dimidio majoribus galea leviter arcuata tubo subcontinua et sursum potius sensim acuminata quam rostrata staminibus parum supra summum ovarium ex adverso tubi infractionis insertis filamentis insertione villosulis ceterum glaberrimis ovario globoso-ovoideo stigmate exserto.—P. ophiocephala *Maxim.*, *Mel. Biol.* xii, 867, *t.* 5, *f.* 94; *Prain*, *Jour. As. Soc. Beng.* lviii, 2, 262.

In Himalaya occidentali :—Kamaon ; in valle Ralam, 13—15,000 p. s. m. ; a jugo Ralam ad occident. versus, 14—15,000 p. s. m. ; in angustis Lebang, 16—17,000 p. s. m. ad latus vallis orientale et prope Bidang in valle Dhauli, 14—15,000 p. s. m., *Duthie* (n. 3225, n. 3228)! Nepal occidentali ; ad Nampa Gadh, *Reid !* apud Barji-kang, 14,700 p. s. m., *Strachey et Winterbottom.* Julio et Augusto floret ; corolla rosea.

Caulibus 4—18 cm. altis rhizomate 1—8 cm. longo radicibus 3—6 cm., petiolis radicalibus 5—6 cm. caulinis 2—2·5 cm. laminis 2·5 × 0·5—0·75 cm. segmentis 4 × 2 mm., calyce 8 mm. longo hoc 3·5 mm. lato, corollæ tubo 12 mm. longo galea 11 mm. longa hac 3 mm. lata labio 20 mm. lato.

Plate 33. A; figs. 1—4.—Pedicularis ophiocephala *Maxim.*

Specimen from Ralam valley, Kamaon; (Duthie n. 3225).

This account of *P. ophiocephala* is based on an examination of 17 specimens. The species is very closely related to *P. Roylei*, to which it bears exactly the relationship that

P. globifera does to *P. cheilanthifolia*, that is, it repeats every character of habit, foliage, calyx and corolla tube, and is finally only diagnosed by its longer galea, which is acuminate instead of truncate, and by its lip with lobes emarginate instead of entire.

60. **Pedicularis Roylei** *Maxim.* (1881).

Humilis vel sæpe nana nonnunquam tamen elata rhizomate lignoso nodoso vel elongato collo squamato radicibus cæspitosis fusiformibus caulibus simplicibus vel rarius ramosis 2—4-fariam pilosis gracilibus vel strictis foliis radicalibus cæspitosis longius petiolatis caulinis verticillatis verticillis (1—2) ter-quaternatimve foliatis breve petiolatis lineari-oblongis pinnatipartitis segmentis 6—9-jugis oblongis acutis inciso-serratis floribus subsessilibus verticillis sæpissime 4-floris numerosis (vel in sub-varietate "*speciosa*" paucis) approximatis vel inferioribus distantibus bracteis foliaceis imis distincte petiolatis summis calyce brevioribus calycis pilosi campanulati antice parum fissi 5-dentati segmento summo deltoideo lanceolatove integro reliquis e lata basi lanceolatis usque ad medium dentatis corollæ tubo sursum ampliato calycem distincte excedente basi infracto labio 3-lobo lobis orbiculatis lateralibus medio duplo majoribus galea leviter arcuata tubo subcontinua apice subincurva erostri staminibus parum supra summum ovarium ex adverso tubi infractionis insertis filamentis insertione villosulis ceterum glaberrimis ovario globoso ovoideo stigmate exserto capsula ovata oblique acuminata triente exserta seminibus ovatis testa pallidis distincte reticulatis.—P. Roylei *Maxim.*, *Mel. Biol.* xi, 288 et xii, 891, *t.* 4, *f.* 122; *Prain*, *Jour. As. Soc. Beng.* lviii, 2, 261.—P. verticillata *Benth.*, *Scroph. Ind.* 53 (*nec Linn.*) (1835); *Hook. f.*, *Flor. Brit. Ind.* iv, 309: *Walp.*, *Rep.* iii, 411 (*pro parte, nec Linn.*) (1844); *Benth.*, *DC. Prodr.* x, 563.—P. amœna *Ad.* VAR.—; *Maxim.*, *Mel. Biol.* x, 97 (1877).

In HIMALAYA occidentali:—Kamaon, *Royle!* Laka, *Edgeworth!* In Chamba et in jugo Sanch, 15,000 p. s. m., *Ellis* (nn. 376, 1719)! Tehri-Garhwal;—in Rudughera, 16,000 p. s. m., ad Ouri Gadh in valle Nila et ad Dudu Gadh infra Srikanta, 15—16,000 p. s. m., *Duthie* (nn. 236, 564)! Pangi; 11—16,500 p. s. m., *Heyde!* In Himalaya orientali;—Sikkim, *regione alpina*, 11—13,000 p. s. m., *Hooker!* Aloktong, 13—15,000 p. s. m., *Anderson!* Lachoong; Cholamoo, 15,000 p. s. m. (forma nana); Onglathang, infra Kinchinjanga, et Olakthang ad fines Nepaliæ orientalis, 15,000 p. s. m., etiam Bijan Nepaliæ orientalis, 12,000 p. s. m., *Kingii mercenar.!* Chumbi, Yeumtong, 11,000 p. s. m., Panka-bee-see-mo; Tan-ka-la; Gup-ten-de-la et Ka-poop, *Kingii mercenar.!* Phari; (ter), *Kingii mercenar.!*

DISTRIB.—Tibet boreali; China, prov. Szetschuan.

Subvar. "*speciosa;*" bracteis longius petiolatis foliis oppositis floribus distincte pedicellatis multo majoribus.

In HIMALAYA orientali:—Jongri; Pey-kiong-la (bis), *Kingii mercenar.!*

Caulibus 2—25 cm. altis, rhizomate 1—6 cm. longo radicibus 5—6 cm. longis, petiolis radicalibus 3—6 cm. caulinis 2—2·5 cm. laminis 2·5 × 0·5—0·75 cm. segmentis 3—4 × 1—2 mm., calyce 8 mm. longo hoc 3·5 mm. lato, corollæ tubo 11 mm. longo galea 6—7 mm. longa hac 2·5 mm. lata labio 12 mm. lato, capsula 12 mm. longa 6 mm. lata seminibus 1·25 mm. Julio et Augusto floret; corolla punicea.

Subvar. "*speciosa*" pedicellis inferioribus 10 mm. longis, corollæ tubo 16 mm. longo galea 9 mm. longa labio 18 mm. lato. Septembre floret; corolla punicea.

PLATE 33. B, C; figs. 5—11.—Pedicularis Roylei *Maxim.*

B—Specimen from Pangi.
C— ,, of subvar. "*speciosa*" from Jongri.

This account of *P. Roylei* is based on an examination of 161 specimens. The species in habit and foliage closely resembles *P. verticillata*, which is, however, distinct. The diagnosis is as follows :—

bracts pinnatisect or -partite, calyx deeply toothed hardly cleft upper tooth entire the others serrate, corolla tube bent in middle obtusely, filaments inserted near middle of tube all glabrous, anthers ovate acute, capsule ovate acuminate half exserted, seeds 1·25 mm., pale, distinctly reticulated *P. Roylei ;*

bracts ovate subentire, calyx hardly toothed cleft to the middle margin entire, corolla tube abruptly bent at junction of middle and lower third, filaments inserted opposite top of ovary anterior pair hirsute, anthers broadly elliptic muticous, capsule lanceolate acute more than half exserted, seeds 2 mm. nigrescent minutely reticulated ... *P. verticillata.*

Reichenbach's figure of *P. verticillata* (*Icon. Fl. Germ. t.* 1762, *f.* 1—14), which is in other respects good, unfortunately gives the anterior filaments glabrous, which is erroneous. Lange (*Bot. Tidskr. Kjob.* iv, *t.* 2, *f.* 3) has given a very exact figure of the seeds of *P. verticillata*, which are remarkably unlike those of *P. Roylei* (cf. Plate 37).

I have in this case avoided giving a varietal definition of the typical plant because the striking form from Jongri, which has been received twice from the same locality (September 1887, and again September 1888), does not appear to differ by any other character than the much larger flowers. It has not yet been collected in fruit, and is only tentatively advanced as a sub-variety. It is *not*, as the artist unfortunately has indicated (fig. C.), 2-denticulate below the apex.

The character of discrete or contiguous anthers (cf. figs. 8 and 9) relied on by Dr. Regel and others in the diagnosis of *P. verticillata* is, I find, of no value in this species.

61. Pedicularis gibbera *Prain* (1889).

Nana glabrata vel 2-fariam pilosa rhizomate tenui brevi vel elongato nodis squamigeris radicantibus radicibus fibrosis fusiformibusve carnosis longioribus caulibus simplicibus vel e basi pauciramosis foliis radicalibus mox evanidis caulinis oppositis longe petiolatis late ovatis pinnatipartitis floribus pedicellatis axillaribus racemis paucifloris bracteis foliaceis calycis campanulati membranacei antice vix fissi 5-dentati segmento summo minimo deltoideo integro reliquis subæqualibus lanceolatis apice obtusis subcristatis 4-plo minore corollæ tubo calyce sesquilongiore ipso apice incurvo et ampliato labio 3-lobo lobis rotundatis parum emarginatis æquilatis galea recta erecta tubo duplo latiore apice potius sensim acuminata quam rostrata integra staminibus medio tubo insertis filamentis anticis barbatis ovario lanceolato stigmate incluso capsula oblique lanceolata acuta seminibus paucis ovatis majusculis testa nigrescentibus minutissime punctulatis.—P. gibbera *Prain, Jour. As. Soc. Beng.* lviii, 2, 262.

In HIMALAYA orientali :—Sikkim ; ad Esan-nan-gi ; Pey-kiong-la ; Tha-moo-tsa ; Sikkim-oral (bis); Domkerka et Bijan, 12—14,000 p. s. m. (loci omnes in vel prope dist. Jongri), *Kingii mercenar. !* Julio, Augusto, et Septembre floret ; corolla nunc punicea nunc alba notatur.

Caulibus 2—15 cm. altis rhizomate 0·5—4 cm. longo radicibus 4—7 cm. longis, petiolis 0·5—1·5 cm., laminis 1 × 0·5 cm., pedicellis 1—2·5 mm., calyce 4·5 × 2·5 mm. corollæ tubo 7 mm. longo galea 5 × 2·5 mm. labio 7·5 mm. lato, capsula 8 mm. longa seminibus 3 mm. longis.

PLATE 29. B; figs. 9—16.—Pedicularis gibbera *Prain*.

Specimen from Esan-nan-gi, Jongri.

The account of *P. gibbera* is based on an examination of 75 specimens. This interesting little species was never reported till 1887. In that and in the following season, Dr. King's collectors met with it, and communicated large suites of specimens. Perhaps its most striking character is its ovulation—(2 ovules to each placenta, 4 to each locule); it is, however, undoubtedly a *Pedicularis*. Although it has to be placed alongside of *P. polygaloides*, it is also closely related to *P. pygmæa*, which has, however, different bracts and leaves, has the corolla tube bent lower down, the galea apiculate, and all the filaments glabrous. Then the lanceolate capsule, the very large, hardly-pitted, dark-coloured seeds, and the long-petioled ovate leaves recall *P. flexuosa*, and appear to indicate considerable affinity with the group to which that species belongs. One feature of interest in this species is the apparent fondness of some insect for its anthers. In nearly every gathering the upper part of the galea containing the anthers has been bitten off from some of the flowers, and in some cases almost every flower has been treated like this. The same thing has been noticed in no other Indian species.

62. Pedicularis polygaloides *Hook f.* (1884).

Nana diffusa vel humilis multicaulis rhizomate tenui lignoso radicibus fibrosis caulibus gracillimis flexuosis 2-fariam pilosis foliis radicalibus cæspitosis demum evanidis caulinis oppositis (vel rarissime 3—4-natim verticillatis) breve petiolatis vel sessilibus ovatis vel ovato-oblongis obtusis pinnatifidis et inciso-dentatis floribus axillaribus pedicellatis pedicellis inferiorum calycem superantibus verticillis summis confertis reliquis remotis bracteis superioribus pinnatifidis calycis villosi oblongo-campanulati antice triente fissi 5-dentati segmento summo minuto integro reliquis cristatis vicinis ovatis latioribus anticis lanceolatis corollæ tubo calyce sesquilongiore apice ipso dilatato incurvo labio 3-lobo lobis lateralibus ovatis medio rotundato dimidio latioribus galea recta decliva tubo sesquilatiore in rostrum brevissimum conicum subacutum 2-lobum abeunti staminibus fere apice tubi insertis filamentis glaberrimis ovario ovato-lanceolato stigmate incluso capsula anguste ovata oblique acuta calycem triente superante seminibus late ovoideis testa laxa cinerascentibus distincte reticulatis.—P. polygaloides *Hook. f.*, *Flor. Brit. Ind.* iv, 317; *Maxim.*, *Mel. Biol.* xii, 881, *t.* 5, *f.* 113.

In HIMALAYA orientali:—Sikkim: ad Yeum-tong, 14,000 p. s. m., *Hooker;* in transitu Ze-lep-la, *Kingii mercenar.!* Chumbi: in Tang-ka-la, 13,000 p. s. m., apud Ka-poop, atque ad Ta-chey-kung; *Kingii mercenar.!*

Caulibus 2—8 cm. altis rhizomate 1·5—6 cm. longo radicibus 3—6 cm. longis, petiolis radicalibus 0·5—1 cm. caulinis 0·25—0·5 cm. laminis 0·75—1 × 0·25 cm. segmentis 1—2 × 1 mm., pedicellis inferioribus usque ad 8 mm. calyce 6 × 3 mm. corollæ tubo 7 mm. galea 5·5 mm. labio 6 mm. longo hoc 9 mm. lato, capsula 8 mm. longa 4·5 mm. lata seminibus 2 mm. longis. Julio—Augusto floret; corolla purpurea.

PLATE 29. C; figs. 17—23.—Pedicularis polygaloides *Hook. f.*

Specimen from Ze-lep-la.

This species is very nearly related to *P. denudata*, of which it has all the characters of corolla except that the filaments here are glabrous, while those of *P. denudata* are all hirsute. But in habit it repeats all the characters of *P. instar* VAR. *paradoxa*, just as *P. denudata* in habit repeats those of *P. instar* VAR. *typica*.

63. **Pedicularis denudata** *Hook. f.* (1884).

Elata 4-fariam pubescens rhizomate brevissimo radicibus cæspitosis fibrosis caule gracili erecto terete simplice foliis radicalibus emarcidis caulinis sessilibus 4-natim verticillatis oblongo-lanceolatis pinnatilobis segmentis 6—7-jugis contiguis brevibus ovatis et minute serratis floribus subsessilibus 4-ternis verticillato-spicatis verticillis distantibus bracteis foliaceis imis foliis caulinis longioribus calycis herbacei late breve campanulati 5-dentati segmento postico integro reliquis cristatis corollæ tubo calyce sesquilongiore apice ipso dilatato incurvo labio 3-lobo lobis lateralibus ovatis medio rotundato dimidio latioribus galea recta decliva tubo æquilata in rostrum brevissimum conicum subacutum 2-lobum abeunti staminibus medio tubo insertis filamentis omnibus barbatis ovario late ovato stigmate incluso capsula late ovata oblique acuminata calycem parum superante seminibus late ovoideis testa laxa cinerascentibus distincte reticulatis.—P. denudata *Hook. f., Flor. Brit. Ind.* iv., 309; *Maxim., Mel. Biol.* xii, 867.

In HIMALAYA orientali:—Sikkim in valle Lachen, 12—13,000 p. s. m., *Hooker;* ad Patang-la, infra Ze-lep-la, *Kingii mercenar.!* Septembre floret; corolla punicea.

Caulibus 35—50 cm. altis, foliis maximis 3 × 1 cm. segmentis 4 × 3 mm., calyce 7 × 3·5 mm., corollæ tubo 8·5 mm. galea 5·5 mm. labio 6 mm. longo hoc 8 mm. lato, capsula 8 mm. longa hac 6 mm. lata seminibus 2 mm. longis.

PLATE 29. D; figs. 24—31.—Pedicularis denudata *Hook. f.*

Specimen from Patang-la.

There is only one gathering of this species at Calcutta, from which the present description is elaborated. It repeats in every detail the habit of *P. instar* VAR. *typica*, and has the same calyx and almost the same capsule and seeds. The corolla, however, is very like that of *P. polygaloides*, the only differences being a rather lower staminal insertion and hirsute filaments.

64. **Pedicularis mollis** *Wall.* (1828).

Elata sparse pilosa rhizomate subterraneo elongato subincrasso lignoso radicibus fibrosis sparsis caule erecto terete simplice vel ramoso polyphyllo foliis verticillatis verticillis 3—5-foliatis inferioribus breve petiolatis summis bracteisque sessilibus laminis pinnatisectis segmentis 10—15-jugis lanceolatis pinnatipartitis laciniis ovatis acute dentatis floribus breve pedicellatis verticillato-spicatis verticillis inferioribus distantibus summis confertis bracteis foliiformibus calycis pubescentis late breve campanulati profunde 5-dentati segmentis lanceolatis subacutis margine serratis corollæ tubo calyce parum breviore apice incurvo intus ciliato labio 2-plicato antice 3-lobo lobis rotundatis æquilatis margine ciliatis galea inclinata recta tubo dimidio latiore margine faucis ciliata apice sensim acuminata

integra staminibus ex adverso medii ovarii insertis filamentis glaberrimis ovario lanceolato stigmate incluso disco antice incrassato capsula ovata lanceolata oblique acuminata calycem dimidio superante seminibus ovoideis testa fulvis distincte reticulatis.—P. mollis *Wall.*, *Cat.* 415; *Benth.*, *Scroph. Ind.* 53; *Walp.*, *Rep.* iii, 411; *Benth.*, *DC. Prodr.* x, 564; *Bot. Mag.* lxxvii, *t.* 4599; *Hook. f.*, *Flor. Brit. Ind.* iv, 309; *Maxim.*, *Mel. Biol.* xii, *t.* 4, *f.* 126.

In Himalaya occidentali:—Nubra, *Thomson!* Ladak, et Pangi, 11,000 p. s. m., *Stoliczka!* Kamaon; Ralam, 12—13,000 p. s. m.; in valle Nipchang, 12—13,000 p. s. m.; in Palang Gadh, 10—11,000 p. s. m.; et prope Kutti in Byaus, 13—14,000 p. s. m., *Duthie!* Nepal;—infra Kawa, in valle Kali, 10,000—11,000 p. s. m., *Duthie!* in Gossain Than, *Wallich! Scully* (bis)! In Himalaya orientali:—Sikkim; *reg. alpina*, 10—14,000 p. s. m., *Hooker!* Lhasal, supra Tungu, 13,000 p. s. m.; Jongri, 13—14,000 p. s. m., *Kingii mercenar.!* Chumbi;—in valle ejusdum nominis; apud Ta-loong et apud Buckchim prope Chumbi; *Kingii mercenar.!* Phari; *Kingii mercenar.!*

Caulibus 30—80 cm. altis rhizomate 6—8 cm. longo, foliis 3—5 × 0·75—1 cm. segmentis 7 × 2·5 mm. calyce 6 mm. longo corollæ tubo 5 mm. longo galea 5 mm. longa labio 5·5 mm. lato, capsula 12 mm. longa 5·5 mm. lata seminibus 2 mm. longis. Julio—Septembri floret; corolla punicea vel purpurea.

Plate 29. A; figs. 1—8.—Pedicularis mollis *Wall.*

Specimen from Lhasal, above Tungu.
Fig. 2 from *Bot. Mag.* 4599.

This account of *P. mollis* is based on the examination of 89 specimens. The colour seems to deepen as the localities are situated more and more towards the east, Jongri and Chumbi specimens having dark purple corollas, Ladak ones pale pink corollas. The species is closely allied, as Mr. Maximowicz shows, to the *Caucasicæ;* but though it has a low staminal insertion, the corolla tube appears to me to deserve being spoken of as 'infract' rather than 'incurved' at the apex—the difference after all is only one of degree; it certainly is not straight. The figure copied from *Bot. Mag.*, *l.c.*, has the advantage of having been drawn from a fresh flower.

65. **Pedicularis collata** *Prain* (1889).

Humilis vel nana cæspitosa glabra rhizomate nodoso vel breve horizontali collo squamis ovatis membranaceis vestito radicibus cæspitosis fibrosis fusiformibusve caulibus gracillimis brevibus debilibus foliis oblongo-ovatis radicalibus paucioribus longe petiolatis caulinis 1-paribus oppositis vel 0 floralibusque distincte petiolatis petiolis caulinis bracteasumque margine membranaceo prorsus dilatatis laminis oblongis acutis pinnatisectis segmentis 4—7-jugis ovatis pinnatifidis et serratis racemis sæpissime 3-floris rarius 4-floris floribus distincte pedicellatis bracteis foliaceis calycis late oblongi glabri antice vix fissi 5-dentati segmento summo lanceolato integro reliquis oblongo-ovatis pinnatilobis et serratis minore corollæ tubo late cylindrico recto sursum leviter fauce ipso ampliato calyce plus dimidio longiore extus lineatim piloso intus antice glandulose barbato labio 3-lobo lobis ovato-rotundatis supparibus galea recta tubo continua eique æquilata acuminata potius quam rostrata et sub apice prope utrinque denticulata staminibus ex adverso medii ovarii insertis filamentis anticis superne hirsutis ovario late lanceolato stigmate longius exserto disco antice incrassato.—P. collata *Prain*, *Jour. As. Soc. Beng.* lviii, 2, 266.

In Himalaya orientali:—Sikkim; ad fines regni Nepaliæ, apud Ny-e-gu, 14,000 p. s. m., atque in Cho-la, *Kingii mercenar.!* Julio floret; corolla punicea; sp. fructigerum nondum communicatum.

Caulibus 2—6 cm. altis rhizomate 0—1·5 cm. longo radicibus 1—4 cm. longis, petiolis radicalibus 3—6 cm. longis reliquis 1—1·5 cm. laminis 1—2 cm. longis his 0·75—1 cm. latis segmentis 4—5 × 3 mm., pedicellis 3—5 mm. longis, calyce 10—12 mm. longo hoc 4·5 mm. lato, corollæ tubo 17—20 mm. longo galea 10 mm. longa 3·5 mm. lata labio 20 mm. lato.

Plate 31. C; figs. 14—17.—Pedicularis collata *Prain.*

Specimen from Ny-e-gu, Jongri.

This account is based on the examination of 31 specimens. The species recalls the habit of the large flowered form of *P. Roylei* and, less readily, that of *P. schizorrhyncha*, but as regards its corolla structure it is unlike any Indian species. It appears to form a distinct monotypic group near the *Caucasicæ*.

66. **Pedicularis fragilis** *Prain* (1888).

Elongata parce hirsuta rhizomate tenero repente radicibus filiformibus plus minus cæspitosis caule fragili simplice vel parce ramoso imo tertio decumbente nodisque radicante ceterum erecto folioso foliis 3-natim verticillatis subsessilibus membranaceo-herbaceis ellipticis acutis pinnatipartitis segmentis 5—7-jugis late lanceolatis mucronato-inciso-dentatis floribus axillaribus subsessilibus calycis campanulati membranacei antice nec fissi 5-dentati segmentis intervallis paribus anguste lanceolatis æquilongis summo integro reliquis minutissime serratis corollæ tubo extus puberulescente cylindrico calycem duplo superante labio subquadrato intus 2-plicato antice 3-lobo lobis margine ciliatis lateralibus anguste ovatis acutis medio obovato cucullato prominente dimidio angustioribus galea erecta subito in rostrum brevissimum truncatum dilatata staminibus ex adverso medii ovarii insertis filamentis anticis apicem versus puberulis ovario ovato stigmate incluso capsula nec exserta subglobosa subito acuminata seminibus parvulis sphæricis antice sulcatis testa pallidis distincte reticulatis.—P. fragilis *Prain, Maxim., Mel. Biol.* xii, 866, *t.* 5, *f.* 93; *Jour. As. Soc. Beng.* lviii, 2, 263.—Pedicularis sp., *C. B. Clarke, Jour. Linn. Soc.* xxv (1889), 51.

In alpibus Assamiæ;—Khasia, 4—6,000 p. s. m., *Mann* (n. 348)! Barêl; in Pulinabadza; 7,200 p. s. m. et supra Siwenichika, 8,000 p. s. m., *Prain!* in Manipur boreali, 6,500 p. s. m., *Clarke* (n. 42044).

Caulibus 15—30 cm. altis rhizomate 5—8 cm. longo radicibus 2 cm. foliis 3—4 × 1·5—2 cm. segmentis 10 × 4 mm., calyce 5 mm. longo hoc 2·5 mm. lato, corollæ tubo 9 mm. longo, galea 6·5 × 3·5 mm. rostro 1 mm. longo labio 5·5 mm. longo hoc vix 3 mm. lato, capsula 5 × 4·5 mm. seminibus 1 mm. longis latisque. Julio—Septembri floret; corolla viridi! vel alba (Clarke *l. c.*).

Plate 31. A; figs. 1—6.—Pedicularis fragilis *Prain.*

Specimen from Pulinabadza, near Kohima; Angami Naga Hills.

This description is based on the examination of 19 specimens. The species is very distinct; it inhabits humid shady forests in the Assam Hills, and where I gathered

it was distinctly semi-saprophytic and not semi-parasitic. Mr. C. B. Clarke has very kindly verified the identification of the species with the single specimen of his n. 42044 which is preserved at Kew. Both Mr. Maximowicz and Mr. Clarke have (independently) expressed the opinion that this species is nearly related to *P. denudata*, it is therefore with considerable diffidence that I venture to think that this relationship is not at all marked. The very peculiar lower lip whereby it approaches the next species and differs from most other species at present known seems to indicate that the two form together a very distinct and natural di-typic group—as is indicated in the "Conspectus of Affinities" (part ii, chap. vi).

67. **Pedicularis Kingii** *Prain* (1888).

Elata parce pubescens rhizomate brevi repente collo paucisquamato ex axillis squamorum stolona tenera apice squamata emittente radicibus filiformibus caule debili gracillimo flexuoso simplice vel paniculato-ramoso folioso foliis suboppositis vel oppositis omnibus longe petiolatis laminis ovatis pinnatisectis segmentis 5—6-jugis iis cauli propioribus petiolulatis sub-alternis oblongis pinnatifidis laciniis ovatis mucronato-dentatis floribus versus apices caulis et ramorum brevipedicellatis calycis ovato-campanulati membranacei glaberrimi antice profunde fissi 5-dentati segmentis integris deltoideis postico reliquis dimidio majore corollæ teneræ rectæ tubo late cylindrico calycem duplo superante labio subquadrato 2-plicato antice 3-lobo lobis lateralibus acute ovatis medio prominente rotundato concavo duplo minoribus galea parum inclinata fronte rotundata staminibus ex adverso medii ovarii insertis filamentis anticis versus apicem distincte barbatis ovario ovato stigmate subexserto disco antice parum incrassato.—P. Kingii *Prain*, *Maxim.*, *Mel. Biol.* xii, 895, *t.* 5, *f.* 131; *Jour. As. Soc. Beng.* lviii, 2, 264.

In Himalaya orientali:—Sikkim; ad Gang-tuk, *Kingii mercenar.!*

Caulibus 15—30 cm. altis rhizomate 2–4 cm. longo, radicibus 5—6 cm. stolonibus squamigeris 5—10 cm. longis petiolis 2—6 cm. longis laminis 4 × 3 cm. segmentis 12 × 6 mm. laciniis 3 × 2 mm., pedicellis 1—3 mm., calyce 4 mm. longo, corollæ tubo 8·5 mm. longo galea 7·5 × 3·5 mm. labio 4·5 × 3·5 mm.

Augusto floret; color ex sicco forsan albus.

Plate 28. A; figs. 1—5.—Pedicularis Kingii *Prain*.

Specimen from Gang-tuk.

This description is based on an examination of 8 specimens. This species is also a very distinct and remarkable one. Mr. Maximowicz looks on it as an aberrant member of the *Caucasicæ*, and this, I believe, is its true place. Owing, however, to its aberrant nature and to its evident affinity as regards lower lip with *P. fragilis*, I have placed these two in a special group apart from, but still close to, the group *Caucasicæ*.

68. **Pedicularis pycnantha** *Boiss.* (1853); *Hook. f.*, *Flor. Brit. Ind.* iv, 310 (*syn.* P. Alberti *exclus.*) (1884).

Humilis pubescens rhizomate incrassato carnoso extus crustaceo radicibus fusiformibus carnosis collo squamis latis ovatis membranaceis vestito pluricipite caulibus ascendentibus foliis radicalibus cæspitosis demum evanescentibus caulinis verticillis (2) 4-ternis vel nonnunquam verticillo inferiore paribus 2 oppositis decussatim intervallo brevi separatis (rarius

verticillis 4-ternis 3) omnibus petiolatis laminis oblongo-lanceolatis acutis pinnatisectis rhachi alata serratis segmentis 13—20-jugis distantibus lanceolatis acutis serrato-dentatis floribus sessilibus dense spicatis bracteis lanceolatis acutis inferioribus serratis reliquis subintegris calycis lanati subinflati vix fissi 5-dentati segmentis lanceolatis acutis omnibus vel postico excepto margine minutissime serratis corollæ tubo incurvo sursum leviter ampliato calyce parum longiore labio 2-plicato antice 3-lobo lobis rotundatis lateralibus medio prominulo duplo latioribus galea tubo subcontinua eique æquilata erecta erostri fauce medio leviter 2-incisa margine ab incisuris deorsum replicata staminibus medio tubo vel ex adverso summi ovarii insertis filamentis anticis superne barbatis ovario late ovato stigmate exserto disco antice incrassato capsula late ovata calycem æquante apiculata seminibus majusculis ovatis basi appendiculatis testa pallidis distincte reticulatis embryone angustato longissimo.

VAR. *typica;* bracteis subintegris labio galea manifeste breviore lobis rotundatis filamentis paullulum infra medium tubum insertis.—P. pycnantha *Boiss.*, *Diagn.*, ser. i, xii, 45 et *Flor. Orient.* iv, 484; *Maxim.*, *Mel. Biol.* xi, 291 et xii, 895, *t.* 4, *f.* 127.—P. Olgæ *Regel*, *Acta Hort. Petrop.* vi, 348 (1880) et *Plant. Fedsch.* 61.—Pedicularis sp., *Aitchison*, *Trans. Linn. Soc.* n. s. iii (1888), 93.

In HIMALAYA occidentali:—Gilgit, 9—10,000 p. s. m., *Giles!* Afghanistan, in valle Kuram, *Aitchison* (n. 487)!

DISTRIB.—Persia boreali; Turkestania occidentali.

VAR. *Semenowi;* bracteis serratis labio galeam fere æquante lobis leviter emarginatis filamentis ex adverso summi ovarii insertis.—P. Semenowi *Regel*, *Bull. Soc. Mosc.* xli, i, 108 (1863) et *Plant. Semenow.*, n. 810; *Maxim.*, *Mel. Biol.* xi, 294 et xii, 894, *t.* 4, *f.* 129.—P. orthantha *Griseb.* VAR.—; *Maxim.*, *Mel. Biol.* x, 129 (1877).—Pedicularis sp., *Benth.*, *Scroph. Ind.* 54 (1835).

In HIMALAYA occidentali:—Rantak-chu, *Falconer!* Hazara, *Stewart!* Kunawar, ad Hangoo, *Royle!* Lahul, *Hay!* *Watt!* in valle fl. Bhagæ superioris, 9,000—13,000 p. s. m., *Stoliczka!* Pangi, 11—16,500 p. s. m., et in valle fl. Sutlej superiore, 17,000 p. s. m., *Heyde!* Astor, 13,000 p. s. m., *Tanner!* Gilgit, *Giles!*

DISTRIB.—In alpibus Altyn et Alatau; Turkestania orientali.

Caulibus 7—15 cm. altis rhizomate 6—8 cm. longo 0·5—1 cm. crasso, petiolis 3—5 cm. longis laminis 5—7 × 1—1·5 cm. segmentis 12 × 5 mm., calyce 12—14 mm. longo hoc 5 mm. lato, corollæ tubo 15—17 mm. longo galea 8 mm. longa hac 2·5 mm. lata labio 4 mm. longo hoc 5 mm. lato, capsula 14 mm. longa 8 mm. lata seminibus 4 mm. embryone plus 2 mm. longis. Aprilo—Augusto floret; corolla alba, sordide lutea, vel purpurascente.

PLATE 28. B; figs. 6—12.—Pedicularis pycnantha *Boiss.*

Specimen of VAR. *typica* from Sergal at the base of Mt. Sika-ram in dry soil in pine glades (Aitchison, n. 487).

Fig. 12 shows the staminal insertion in a specimen of VAR. *Semenowi* from Upper Bhaga valley.

This account of *P. pycnantha* is based on the examination of 11 specimens of VAR. *typica* and 27 of VAR. *Semenowi*. There is no doubt about the Trans-Indus plant; it is the same species as Boissier's Persian plant—to which also belongs Aitchison's "Delimitation Commission" plant (n. 679 from Khorasan, 6,000), of which quite determinable specimens have been received at Calcutta. But the Punjab Himalayan plant placed by Sir J. D. Hooker in 1884 with Boissier's Persian plant is not quite the same thing, but belongs, as Mr. Maximowicz had pointed out in 1881, to Regel's *P. Semenowi*. The diagnosis given by Mr. Maximowicz is most accurate, and while I think that *P. Semenowi* is conspecific with *P. pycnantha*, there is no possibility of mistaking the one variety for the other on dissection. Of the plant mentioned in *Mel. Biol.* x, 129, as possibly a variety of *P. orthantha*, Mr. Maximowicz has kindly sent me a drawing, as well as a leaf, a bract and 3 flowers from the solitary St. Petersburg specimen. The flowers and bract and leaf are those of *P. pycnantha* VAR. *Semenowi*. In this species the leaves, especially of the lower whorl, are subopposite rather than truly opposite, and as Mr. Maximowicz' sketch shows this plant of Heyde to be a very dwarf form, the condensation of the internodes leaves hardly greater intervals between petioles of different whorls than naturally exist between those of the same whorl, so that *in this condition* the species may be well enough treated, as Maximowicz, *l.c*, has treated it, as an alternate-leaved one. In *Herb. Calcutt.* there is a gathering by Hay in Lahul, where one specimen is exactly like the drawing of Heyde's plant at St. Petersburg, while another has a stem elongated sufficiently to show the verticillate nature of the phyllotaxis. In Dr. Royle's gathering from Kunawar the same thing occurs, and Bentham in describing the plant also speaks of the leaves as alternate. The specimens being destitute of corollas, Bentham did not publish Royle's Mss. name (*P. patens* Royle in sched.) which can never therefore supplant those of Boissier or of Regel. It is, however, only just to observe that Royle and Bentham were the earliest authors to ascribe specific rank to the plant here named VAR. *Semenowi*. With *P. Alberti*, which Sir J. D. Hooker has reduced to *P. pycnantha*, the case is different. There the leaves are certainly very like those of *P. pycnantha* VAR. *Semenowi*, and in short-stemmed specimens might well be considered opposite or subopposite. But where the stems are more elongated the leaves are seen to be distinctly alternate. There are other differences, and *P. Alberti* is more nearly allied to *P. Oederi* than to *P. pycnantha*. The diagnosis is as follows:—

leaves verticillate, spike interrupted whorled centripetal, anterior filaments hirsute . . . . . *P. pycnantha;*
leaves alternate, spike continuous spiral centrifugal, all filaments glabrous *P. Alberti.*

69. Pedicularis Oederi *Vahl* (1806).

Humilis vel elatior hirsuta rhizomate incrassato radicibus fusiformibus carnosis collo squamato caulibus simplicibus oligophyllis foliis radicalibus cæspitosis caulinis sparsis omnibus longe petiolatis lineari-lanceolatis acutis pinnatisectis segmentis 18—25-jugis oblongis ovatisve inciso-serratis floribus breve pedicellatis subspicatis centrifugo ordine apertis bracteis ovatis ligulatisve apice elliptice expansis inciso-serratis calyce longioribus calycis campanulati villosi vel glabriusculi 5-dentati segmentis lanceolatis integris vel apice serratis corollæ tubo cylindrico apice ipso parum ampliato labio antice 3-lobo lobis orbiculatis ovatisve rarius parum emarginatis nonnunquam eroso subcrenulatis lobo medio

stipito proprio lateralibus duplo minore galea tubo continua subarcuata apice erostri staminibus medio tubo vel parum supra medium tubum insertis filamentis anticis hirsutis ovario ovoideo stigmate exserto capsula oblique ovato-lanceolata calycem dimidio superante seminibus ellipticis testa pallide cinerascentibus distincte reticulatis.

VAR. *typica;* galea tubo manifeste breviore lobo labii medio vix prominulo calycis dentibus late lanceolatis apice acutis æquilongis.—P. Oederi *Vahl in Hornem. Oekon. Plantel.* ed. ii, 580 et ed. iii, 674; *Spreng., Syst. Veg.* ii, 782; *Hartm., Flor. Skand.* 199; *Nyman, Syllog. Flor. Europ.* 129; *Reichb. f., Flor. Germ.* xx, 76, *t.* 1759, *f.* 2; *Cesati, Passerini et Gibelli, Comp. Flor. Ital.* 358; *Blytt, Norges Flora* ii, 807; *Lange, Nomenclat. Flor. Dan.* 2; *Arcangeli, Comp. Flor. Ital.* 522; *Trautv., Increm. Flor. Ross.* iii, 77; *Caruel in Parlat., Flor. Ital.* vi, 429; *Steining. in Uhlworm., Bot. Centraiblatt* xxx, 61; *Prain, Jour. As. Soc. Beng.* lviii, 2, 275.—P. versicolor *Wahlenberg, Veg. Helvet.* 118 (1813); *Hartm., Vet. Ac. Handl.* (1818), 135 *et* 156; *Steven, Monogr. Pedic.* 52; *Reichb., Flor. Excurs.* ii, 363 et *Iconogr., Cent.* i, 17, *t.* 14, *f.* 31; *Wahlenberg, Flor. Suec.* i, 389; *Moretti, Bot. Ital.* 6; *Spreng., Syst. Veg.* ii, 782; *Ledeb., Flor. Altaic.* ii, 437; *Host, Flor. Austriac.* ii, 193; *Roehl., Deutsch. Flor.* ed. iii, iv, 379; *Gaud., Flor. Helvet.* iv, 142; *Benth., Scroph. Ind.* 54; *Koch, Synops. Flor. Germ.* 543; *Bertol., Flor. Ital.* vi, 318; *Walp., Rep.* iii, 428; *Benth., DC. Prodr.* x, 578; *Hausm., Flor. Tirol.* 660; *Bunge in Ledeb., Flor. Ross.* iii, 300; *Nyman, Syllog. Flor. Europ.* 129; *Turcz., Flor. Baic.-Dahur.* ii, 2, 375; *Maxim., Mel. Biol.* x, 133; *Nyman, Conspect. Flor. Europ.* 555; *Hook. f., Flor. Brit. Ind.* iv, 316; *Maxim., Mel. Biol.* xii, 918, *t.* 7, *f.* 177.—P. flammea *Oeder, Flor. Dan.* i, 7, *t.* 30 (1761); *Gunner, Flor. Norveg.* n. 247; *Allioni, Flor. Pedem.* i, 63; *Hœncke in Jacquin, Collectan.* ii, 70; *Willd., Sp. Plant* iii, 215; *Lamk, Flor. Franc.* ii, 360; *Poiret in Lamk, Encyclop.* v, 135; *DeCand., Flor. Franc.* iii, 483; *Hartm., Vet. Ak. Handl.* (1814) 107; (*nec* P. flammea *Linn.*).—P. hirsuta *Linn., Sp. Plant*, ed. ii (1763) *in parte* (*nec* P. hirsuta *Sp. Plant.*, ed. i, 609); *Smith in Rees, Cyclop.* xxvi (1819) *in parte.*—P. foliosa *Gunner, Flor. Norveg.* n. 1111 (1766-72) (*nec* P. foliosa *Linn.*).—P. flammea VAR. major *Wahlenberg, Flor. Lappon.* 168 (1812).—P. virescens *Wahlenberg, Flor. Suec.* i, 389 (1824).—P. Oederi VAR. virescens *Hartm., Flor. Skand.* 199 (1843). Pedicularis caule simplici, foliis pinnatis, pinnis dentatis, retroversis, imbricatis *Haller, Stirp. Helvet.* i, 138, *t.* 8, *f.* 3 (1768).—Pedicularis an nova? *Retz, Flor. Scand. Prodr.* ed. ii, 145, *in notul.* (1795).

In HIMALAYA occidentali:—Kashmir, in Pyr Panjal, *Royle!* et ad Guraz, *Falconer!* in transitu Sanch, 12—14,000 p. s. m., *Ellis!* Rotang, 14,000 p. s. m.; Tehra, 15—17,000 p. s. m., *Stoliczka!* in transitu Lanak, 14,000 p. s. m., *Thomson!*

DISTRIB.—In alpibus Europæis Sibiricisque; in arcticis Europæ, Asiæ et Americæ.

VAR. *heteroglossa;* galea tubo fere æquilonga lobo labii medio prominente calycis dentibus lineari-lanceolatis omnibus vel summo excepto ipso apice in laminam ellipticam expansis postico reliquis breviore. *Prain, Jour. As. Soc.*

Beng. lviii, 2, 276 (1889).—P. versicolor *Royle, Illustr. Himal.* 291, *t.* 72, *f.* 2 (*vix Wahlenb.*) (1839).—An eadem sp. [ac *P. asplenifolia*]? *Wall., Lith. Cat.* 416 B, p. 13 (1828).

In HIMALAYA occidentali:—Tehri-Garhwal, in valle Damdar, 14—15,000 p. s. m. atque in Dudu Gadh infra Srikanta 15—16,000 p. s. m., *Duthie!* Kamaon; *Royle! Wallich!* prope glaciem ad Pindir, 14,000 p. s. m., *Collett!* prope Bidang in Dhauli, 14—15,000 p. s. m., *Duthie!* Nepal occidentali; ex adverso pagi Budhi, 10—11,000 p. s. m., *Duthie!* Nepal centrali; *Scully!*

DISTRIB.—China boreali, Tibet boreali.

Caulibus 6—30 cm. altis rhizomate 1—3 cm. longo radicibus 3—8 cm., petiolis 3—5 cm. longis laminis 3—6 × 1 cm. segmentis 5 × 3 mm., calyce VAR. *typicæ* 11—12 mm. longo, VAR. *heteroglossæ* 13—15 mm., corollæ tubo 13—15 mm. longo galea VAR. *typicæ* 9 × 3·5 mm., VAR. *heteroglossæ* 11—14 × 3 mm. labio 7·5—14 mm. lato, capsula 18 × 6 mm. seminibus 2·25 mm. longis.

PLATE 34. A—C; figs. 1—16.—Pedicularis Oederi *Vahl.*

A—Specimen of VAR. *typica* from Guraz in Kashmir (Falconer).
B— ,, ,, *heteroglossa* from Tehri-Garhwal (Duthie, n. 232).
C— ,, ,, ,, ,, Gosain Than in Nepal (Scully, n. 157).

This account of *P. Oederi* is based on an examination of 12 Scandinavian specimens, 17 Swiss specimens, 4 Altai specimens, and 51 Panjab Himalaya and Kashmir specimens of VAR. *typica*, flowers from 81 different specimens having been dissected: of VAR. *heteroglossa* flowers from 32 specimens of the Kamaon form have been dissected, and from 12 specimens of the Nepal form.

The species is most nearly allied to *P. Alberti* and to *P. flammea.* From the first it is easily diagnosed:—

leaf segments ovate obtuse, anterior filaments bearded . . . . . *P. Oederi;*
leaf segments acuminate pinnatifid, all filaments glabrous . . . . . *P. Alberti.*

From the second it is not so easily diagnosed by the naked eye, since certain forms of both have the same habit and foliage; *P. Oederi* is usually, but by no means always, larger and more robust than *P. flammea.* None of the earlier authors give certain diagnostic characters, and the precise diagnosis (stated chronologically) is as follows:—all stamens glabrous in *P. flammea*, while anterior pair in *P. Oederi* are hirsute—Bunge (1847), Reichenbach *f.* (1862), Maximowicz (1877); anthers less muticous in *P. flammea*—Reichenbach *f.* (1862); seeds in *P. flammea* fulvous and narrowly ovate, in *P. Oederi* cylindric-ovate half as broad again and ash-grey—Lange (1870). To these characters may be added:—anthers with long axes oblique in *P. flammea*, horizontal in *P. Oederi.* The diagnosis is therefore as follows:—

anthers horizontal, anterior filaments hirsute, seeds cylindric ovate . . . *P. Oederi;*
anthers oblique, all filaments glabrous, seeds elongate ovoid . . . . . *P. flammea.*

The Kashmir and W. Tibet plant is the same as the Dahurian form, having the calyx hirsute with its teeth, except the upper, serrate; the lobes of the lip are entire as in the Scandinavian and Arctic form (P. Oederi *Vahl* "genuina"), where the calyx is also hirsute, but all the calyx teeth are entire, and not emarginate as in the Swiss plant (P. versicolor *Wahl., Veg. Helvet.* 118), where the calyx teeth are also entire, the calyx being glabrous.

The Kamaon form is = *Wall. Cat.* 416 B, which Wallich only doubtfully referred to his *P asplenifolia.* It probably is the plant intended by Royle (*Ill. t.* 72, *f.* 2), since he figures a plant with a small lower lip, which is true of this, and since specimens of this obtained by him in Kamaon are preserved at Saharanpur. But the lip of his figured plant is too small even for this form, and he cites Kashmir in the text (p. 291) as one locality; his Kashmir specimens, which are from Pyr Panjal, are true VAR. *typica* only. The various Kamaon gatherings exactly agree;—calyx hirsute, upper tooth linear lanceolate acute, lip of corolla $\frac{1}{3}$ *smaller than* in VAR. *typica*, margin crenulate, central lobe ovate lanceolate, galea $\frac{1}{2}$ longer than in VAR. *typica*, as narrow as tube. Dr. Scully's Nepal plant differs considerably;—calyx glabrescent, all the teeth with ovate expanded tips, corolla lip 3 *times as large as* in VAR. *typica*, margin entire, lobes orbicular, galea narrower than tube. The greatest difference is in the much larger lip; perhaps VAR. *heteroglossa* should be considered a species distinct from *P. Oederi* with the Nepal plant as a definite variety of this new species. Mr. Maximowicz describes another variety in *Mel. Biol.* xii, 918. I have seen no specimen of this variety, and cannot express an opinion concerning its corolla lip; it has entire calyx teeth, however, and has a tawny-red corolla. In VAR. *heteroglossa* the corolla is uniformly yellow; in VAR. *typica*, whether from the Alps of Europe, from Siberia, or from Kashmir, the corolla is, as it is throughout the Arctic circle, yellow with upper part of galea, wherein the anthers lie, reddish-brown. This reddish-brown galea-top may be absent and 2 red or pink spots at the edge of the throat be present instead. This variation occurs in Swiss, in Norwegian and in Kashmir gatherings alike. Not infrequently too in European and in Arctic gatherings the corolla is, as it normally is in VAR. *heteroglossa*, uniformly yellow. The species varies a good deal in habit, ranging from a dwarf condition very much resembling *P. flammea*, with which species, owing to the inadequacy of the Linnean diagnoses, many of the earlier European authors have identified it, to a tall condition not unlike *P. foliosa*, for which Gunner *l.c.* mistook it. This condition—for it is no more than a robust condition of the Scandinavian-Arctic form of the type—Wahlenberg (*Flor. Suec.* i, 389) even ventured to deal with as a species (*P. virescens*), and Hartmann (*Flor. Skand.*, 199) has kept it apart as a variety.

Those authors who have made an especial study of the genus (Steven, Bentham, Bunge, Maximowicz) agree in considering the Swiss form of this species conspecific with the Scandinavian, and this has to be borne in mind in dealing with the synonymy of the species, which is of so complex a nature and is so voluminous that I have endeavoured to give it as nearly as possible in full, consulting each work quoted when accessible to me, and getting friends in Europe to verify citations when the work quoted was not available in India. As here and there in this mass of literature a few errors of citation have crept in, I have analysed the synonymy as a whole. Briefly summarised, the result is that a line may at once be drawn between the synonymy of last century and the synonymy of the present one, the synonyms of the earlier authors being the result of a confusion of identity, those of more recent writers being the outcome of a dispute as to priority of name. This will become more apparent if the historical method be pursued.

The species was identified by OEDER (1761) with *P. flammea* of Linnæus, nor is there anything in Linnæus' verbal diagnosis (1753) to prevent the identification. But LINNÆUS (1763) at once detected the want of agreement between Oeder's figure and his own species. He, doubtfully however, referred Oeder's plant to his own *P. hirsuta*, a step in

which no European botanist appears to have followed him, except Smith, whose description (1819) shows more evidence of compilation than of study of specimens. Gunner (1766) again took the same Norwegian plant for *P. flammea;* Haller (1768) and Allioni (1785) placed the Swiss form of the species under *P. flammea* also. Haller's criticism of Oeder's figure only succeeds in showing that his specimens were inadequate, and his own figure is not particularly instructive. Willdenow (1800) is doubtful about referring the Norwegian plant to *P. flammea;* neither he, nor Allioni or Lamarck (1778) before him, nor Poiret (1804) or De Candolle (1805) after him, hesitate about referring the Swiss plant to Linnæus' *P. flammea.* Retzius (*Flor. Scand.*, ed. i, 1779) expressed for the first time the opinion that the plant figured by Oeder was specifically distinct alike from *P. flammea* and from *P. hirsuta*, and though Hæncke (1788) in a very lengthy and careful article rebuts this opinion of Retzius, and insists on the identity of this species with *P. flammea*, Retzius declined to agree with him, and re-asserted (1795) his opinion that it may be a good species. Unfortunately Retzius did not formulate his opinion by providing the species thus recognised by him with a definition and a name. Hæncke's description is extremely accurate, but curiously he omits to mention the hairs on the anterior pair of filaments which his Judenburg specimens must have exhibited, and which after all afford the most palpable diagnostic mark between this species and *P. flammea.* It is somewhat strange that Walpers, whose citations are as a rule so correct, attributes the article by Hæncke to Wulfen, and places it in vol. i instead of in vol. ii of *Jacquin's Collectanea;* p. 70, vol i, which he actually quotes, is occupied by accounts of *Sisymbrium pannonicum* and *Turritis hirsuta* by Jacquin himself. Even if the citation of a wrong volume be only an oversight in reading proof the misquotation of authority still remains. Retzius' view was adopted by Vahl (1806), who described the Norwegian form of the species under the name *P. Oederi.* Wahlenberg does not seem to have been aware of the appearance of Vahl's name in 1812, when he described the same form as *P. flammea* var. *major*, and probably was still ignorant of that name in the following year, when he gave the name *P. versicolor* to the Swiss form of the species. Hartmann, who in 1814 was of opinion that Oeder's Scandinavian plant was the same as *P. flammea*, noted in 1818 that it is really conspecific with the Swiss *P. versicolor.* What is of greater interest for us is to know that when Hartmann wrote in 1818 he was aware that this species (*P. versicolor*) was known to Danish botanists as *P. Oederi*, but there is nothing to show whether his preference for Wahlenberg's name over Vahl's was because he thought that Vahl's name had been published between 1813 and 1818, or because of a laxity then prevalent in the matter of recognising priority. Hartmann's view received the warrant of Steven's judgment in 1823, though there is no indication that Steven knew of the prior publication of a name for the Norwegian plant, and Steven's limitation was adopted by the elder Reichenbach in the following year. In the same year (1823) Sprengel gave a valueless verbal diagnosis between the two forms, and Nyman so late as 1854 kept them apart in the *Sylloge Floræ Europæ.* He is, so far as I can discover, the only author who has hitherto given the true date of publication of the name *P. Oederi.* It is therefore somewhat perplexing to find in 1880 the same author in his *Conspectus* according a subordinate position to what he had himself already shown was the older name. No author besides Sprengel and Nyman appears to have kept the two forms apart, and indeed in 1824 Wahlenberg himself had assented to the identity of the Scandinavian form with his own Swiss species. He quotes Hartmann as already having expressed this view; but, though he

gives the name *P. Oederi* as a synonym, he cites it as being first published in the 3rd edition of Hornemann's *Plantelære* in 1821, or eight years later than the appearance of his own name for the Swiss form, whereas if he had read the reference by Hartmann on page 156 of the volume of *Vet. Ak. Handl.* (for 1818) quoted by him, he must have realized that the name *P. Oederi* there referred to had been in use prior to 1818. Since the species was one for which he himself was responsible, if he knew that the name *P. Oederi* had been also applied to it, it was in a peculiar sense his duty to ascertain where and when the name *P. Oederi* first had appeared. WALPERS in 1844 followed Steven and perpetrated the curious misquotation already mentioned; BENTHAM also followed Steven in 1846. Neither Walpers nor Bentham quote Vahl's name, which may therefore be assumed to have escaped their notice. BUNGE, on the other hand (1847), deliberately excludes Wahlenberg's Scandinavian plant without saying (*Ledeb.*, *Flor. Ross.* iii, 300) where it should be located, and complicates matters still more by saying that *P. Oederi* of the Danish botanists is a plant from Iceland, and that it has all the filaments glabrous. Now in the first place Wahlenberg's Scandinavian plant (there is a specimen of Wahlenberg's at Calcutta) has the anterior stamens hirsute, and certainly *is* the same as his Swiss *P. versicolor*, of which there are also authentic specimens here; in the second place, Oeder (*Flor. Dan.* i, 7) says his plant is from Norway, and does not mention Iceland at all; finally, if the plant that is *P. Oederi* has glabrous stamens, then *P. Oederi* should become a synonym of *P. flammea*, which Bunge has refrained from making it. TURCZANINOW (1856) also rejects Wahlenberg's Scandinavian synonym, in this clearly simply copying Bunge; he does not face any of these three difficulties to Bunge's note. The younger REICHENBACH's treatment of the question (1862) is more extraordinary still. He accepts Vahl's name, but gives the 1821 edition of Hornemann as its place of publication. To obviate the necessity of palpably violating the law of priority, he takes the opposite course from that pursued by Bunge, suppresses Wahlenberg's *Swiss* synonym of 1813 (*Veg. Helvet.* 118), and says that that author's *Scandinavian* synonym of 1824 (*Flor. Suec.* i, 389) is the earliest appearance of the name *P. versicolor*. STEININGER, whose careful critical revision of the European species of *Pedicularis* is the most recent (1887), has given the synonymy of this species less satisfactory treatment than he has that of any of the other European ones. He begins by adopting Vahl's name—but copies Reichenbach's error of quoting the 1821 work as its place of first publication. He follows this error by copying Walpers' one of quoting Wulfen as the author of a notice written by Hæncke, and immediately after gives Wahlenberg's name for the *Swiss* plant—published in 1813—as a synonym for a name that he supposes to have been only published in 1821. Steininger also adds "P. asplenifolia *Baumg. non Flœrke*" as a further synonym. As he does not say *where* Baumgarten fell into this error, I have been unable to verify his citation.

To conclude: the earliest name is clearly P. Oederi *Vahl*, which appeared first in 1806 and is thus seven years older than Wahlenberg's name. There is not now, and there need never have been, the slightest dubiety about the identity of Vahl's plant. As has been shown above, both it and the Swiss form have been equally mistaken for *P. flammea*, while both it and the Swiss plant have been long known to be the same thing. The name given by Wahlenberg has become perhaps better known than Vahl's name, but not to so great an extent as to justify a deviation from exact compliance with the law of priority, and Vahl's name *P. Oederi* is therefore the one that must in future be accepted.

Excluded and Doubtful Species.

There is in the Calcutta Herbarium a gathering in leaf only of a very distinct species:—

70. **Pedicularis** sp. rhizomate lignoso ramoso foliis alternis radicalibus cæspitosis petiolatis petiolis 1·5—2·5 cm. longis margine herbaceo prorsus dilatatis laminis 6—9 cm. longis his 1·75—2·25 cm. latis pinnatisectis rhachi alatis supra omnino glaberrimis subtus petiolo nervisque parce hirsutis ceterum glabris segmentis 10—12-jugis subalternis obtusis 10 mm. longis his 4—5 mm. latis pinnatifidis et margine cartilagineo serrato-dentatis.

In alpibus Assamiæ:—Manipur boreali; in Sirohifurar, 8,000 p. s. m. *Watt* (n. 6479)!

This is very distinct from any Indian species, and appears as if it must belong either to the *Eusiphonanthæ* or to the *Hyposiphonanthæ* subsection. Mr. Maximowicz, who has very kindly examined it (in spite of its incomplete condition) at my request, tells me that he cannot match it with any of the Chinese species, which he knows so thoroughly. He says of it—"looks like a *Siphonantha* or (less so) a *Comosa*;" it should therefore be a species yet to be described.

Plate 35. B.—Pedicularis sp. indica n. 70.

Specimen from Sirohifurar (Watt, n. 6479).

There is one Indian plant that has to be mentioned as an excluded species:—

Pedicularis? avana Wall., Cat. 1007 (1828); Benth., Scroph. Ind. 52 (1835). The same species was issued as an Acanthaceous plant, which it is, by Wallich in the following year. But the identity of this with that Acanthaceous plant was not made public till 1876. Up to that date therefore the synonymy must be shown in a double column.

Pedicularis? avana *Wall.*, *Cat.* 1007 (1828).	Adenosma biplicata *Nees in Wall.*, *Cat.* 7146 (1829).
——— *Benth.*, *Scroph. Ind.* 52 (1835).	——— *Nees in Wall.*, *Pl. As. Rar.* iii, 79 (1832).
Synnema avanum *Benth.*, *DC. Prodr.* x, 538 (1846).	——— *Nees in DC. Prodr.* xi, 68 (1847).
	——— *T. Anders.*, *Jour. Linn. Soc.* ix, 454 (1867).

Cardanthera biplicata *Benth. in Gen. Pl.* ii, 1074 (1876).
Cardanthera avana, *C. B. Clarke in Hook. f.*, *Flor. Brit. Ind.* iv, 405 (1884).

In *DC. Prodr.* xi, 68 (1847), Nees limits the genus *Adenosma* so as to *exclude* the species that formed the type of Adenosma R. Br. [*Prodr. Flor. Nov. Holl.* i, 442-3 (1810)]. As Adenosma *Brown* had just been reduced by Bentham [*DC. Prodr.* x, 380 (1846)] to Stemodia Linn., Nees felt at liberty to retain Brown's name for the genus thus limited, seeing that Brown himself had in the work quoted declared two Acanthaceous plants that still remained in the genus to be in his opinion congeneric with the solitary Scrophulariaceous species taken as the type. Nees mentions however, for the first time, in the same place (*DC. Prodr.* xi, 67) the name Cardanthera Ham., which he gives as synonymous with Adenosma of Nees (not of Brown).

In *Gen. Plant.* ii, 949 (1876) the genus ADENOSMA R. Br. (1810) is restored. The name *Adenosma* Nees (1847) therefore falls, and Bentham has issued the alternative name CARDANTHERA Ham.

EXPLANATORY NOTE ON THE ILLUSTRATIONS.

The isothermal line on the MAP illustrating the geographical distribution of *Pedicularis* is translineated from a map in Keith-Johnston's Physical Atlas. It appears there as the mean summer isotherm of 59°F.

The TABULA AFFINITATUM is an attempt to represent graphically the facts expressed in Chapter VI. It possesses all the advantages over the serial disposition of the literary "conspectus" that a representation in two dimensions must pos-ess when compared with a representation in one dimension, but at best the results obtained are merely approximate.

In the PLATES proper the figures of the various species are drawn by the native artists whose names appear in the left-hand corners. The analyses have in each case been made and delineated by the writer. These have been made as nearly uniform as possible in all the species and explain themselves. The analyses are to be understood as being made of flowers belonging to the particular plant of which a drawing is given; the instances where this is not the case are indicated in the text. In PLATE 35C types (among Indian species) of the various subsectional corolla-forms are placed side by side so as to assist the eye in understanding the passages on classification. In PLATES 36 and 37 the writer has attempted to extend to Indian species the treatment accorded to the seeds of European and Asiatic species by Dr. Lange. They fall far short of the excellent results obtained by that author, and it is to be hoped that Dr. Lange may one day provide a similar comparative view of the seeds of Chinese species. The value of seed characters is very high; not for diagnosis, since so many species have similar seeds, nor for general classification, since closely allied species have often such different ones, but for the true limitation of the natural groups so characteristic of the genus.

W. [illegible] Rec. No. 5 90] -350- 26-9-90.

INDEX.

Names of the Indian species and names of Botanists are in ionics; names of groups, synonyms, an names of species or genera incidentally referred to are in italics.

Abelia 50
Acaules 91; 19
Accurate diagnosis, characters available for 16
Adenosma biplicata Nees ... 187
ADUNCÆ Prain ... 74, 146; 19, 20, 21, 22, 52, 54, 55, 61
Aestivation of beak ... 9
„ of lip and hood ... 6
Afghanistan ... 27, 51, 54
Aitchison 39
Akha (Himalaya) 39
Alaska 23, 43, 44, 47, 49, 51
Alatau range 24, 49
Albumen 14
Altai range 24, 49
Alternate-leaved species ... 11, 18
Alternating migrations, hypothesis of 40
America ... 23, 24, 25, 43, 49
American meridian of distribution 43, 45, 46, 48, 50, 54
„ province... 24, 25, 27
Amœnæ 94
Analysis of floral structure necessary 16
Andean district 24
„ division 27
Anderson, J. 39
„ , T. 39
Andes of Colombia... ... 44
„ , Northern 27
Annexation of Yunnan to Himalyan province ... 37
Annual species 2
ANODONTÆ Bunge 91, 168; 8, 10, 20, 21, 22, 47, 52, 55, 57
Anthers 12
Apex of beak 8
Application of canons of diagnosis 16
„ „ of phytogeographic delimitation ... 25
Arakan 34, 39
Archaic types, evidence as to ... 50, 55
„ of corolla ... 44
Arctic-Alpine secondary flora ... 22
„ America 25
„ Europe 26, 43
„ Siberia 26, 43
Armenian highlands ... 24
Arun river 39
Asia Minor 24, 50
Asplenifoliæ 79
Assam 26
Assam-Burma uplands district 34, 39
Axillares 73; 58

Badakshan 39
Baffin bay 43
Baikalia 24, 49
Balkan 49, 50
Ball, J. 51
Baltistan 39
Base of galea 8
„ labium 8
Beak of corolla 8
Beddome 39
Bentham ... 1, 15, 18, 58, 61
Bicuspidatæ 18
BIDENTATÆ Maxim. 85, 165; 8, 20, 21, 22, 47, 52, 55, 57
Blytt, A. 24, 51
Boissier 61
Bootan (Himalaya)... ... 34
Booth 39
Bracts 4
Brahmaputra river... 26, 27, 39
Branching, modes of ... 3
Brandis 39
Brevifoliæ 72
Brevilabres 98
Brevitubæ 69
British Columbia 24
„ islands 51
Buchanan-Hamilton (*see* Hamilton) 39
Bunge 1, 61
Burail range 39
Burma 26, 50
Burmann 39

Cæspitosæ 78
California 44
Calyx 5
„ in diagnosis, value of ... 14, 17
Canada 24, 51
Canadenses 91
Canons of diagnosis ... 16
Canons of phytogeographic delimitation 23
Cape Colony 42
Capitatæ 92
Capsule 13
„ in diagnosis, value of 14, 17
Cardanthera avana Clarke ... 187
„ *biplicata* Benth.... 187
Carnosæ ... 77; 19, 20
Caruel 17
Caspian sea 24
Caucasian province ... 24
„ „ , ANODONTÆ in the 57
Caucasicæ 98; 22
Caucasus range 24
Cauline leaves 4
Central Asian desert ... 24
Centrifugal inflorescences ... 4
Centripetal „ ... 4
Ceylon ... 27, 38, 39, 50
Chamba 39
Champion 39
Cheilanthifoliæ 93; 22
China 24, 26
„ , Northern 43, 51
Chinese province 24
Chittagong 39
Chumbi ... 31, 39, 54, 58
Circumpolar flora 40, 41
„ province ... 23, 58
Clark, J. 39
Clarke, C. B. 39
CLAVIS ARTIFICIALIS ... 100
Collata 97; 58
Collett 39, 50
Colombia (*see* New Grenada) ... 24, 44
Colour distribution, general ... 45
„ „ in Himalayan province ... 47
„ of corolla 11
„ of seeds 13, 45
Comosæ 87
Conifera 85; 58
Consistence of corolla ... 8
CONSPECTUS AFFINITATUM ... 66
„ of the Himalayan province ... 39

Contortion of throat of corolla 11
Corolla 6
,, , distribution by structure of 45
,, , morphological evidence from 44
Correlation of beak with tube and lip 9
Cotyledons 14
Crests of lip 8
Curvature of corolla-tube ... 8
Curvipes 76
Cyclophylla 93

Daphla (Himalaya) ... 39
Darwin 40
Davis Strait 43
Debiles 72; 58
Decaisne 61
DeCandolle, C. 50
Definition of genus *Pedicularis* 66
,, of Sikkim proper ... 31
Defloration 13
Dehiscence of capsule ... 13
Delavay 39
Delimitation of phytogeographic provinces 23, 39
Denudatæ 96
Desert, Central Asian ... 24
Development of corolla-tube ... 6
,, of rostrum ... 8
,, of staminal hairs 12
Diagnoses Plantarum Asiaticarum 38
DIAGNOSIS AND CLASSIFICATION OF SPECIES ... 14
,, of groups ... 17
,, of species ... 14
Diagnostic characters ... 16, 17
Diagram construction, explanation of ... 42
,, (4) distribution by colour ... 46
,, (5) ditto by phyllotaxis ... 48
,, (3) ditto by structure 45
,, (8) ditto of ADUNCÆ 55
,, (11) ditto of ANODONTÆ ... 56
,, (10) ditto of BIDENTATÆ ... 66
,, (9) ditto of BIDENTATÆ and ANODONTÆ 55
,, (6) ditto of LONGIROSTRES ... 53
,, (7) ditto of RHYNCHOLOPHÆ ... 53
,, (2) endemic percentages ... 42
,, (1) genealogical disposition of sections ... 21
,, (12) relationships of *Robustæ* and *Pumiliones* ... 125
Difference in habit with similarity of floral structure ... 15
Dihong river 39
Disc 6
Disposition of sections, natural 20
DISTRIBUTION, GEOGRAPHICAL... 22
,, by colour ... 45
,, by phyllotaxis ... 47
,, by sections ... 44, 52
,, by structure of corolla ... 45
,, of BIDENTATÆ discussed ... 57
,, , zonal 42, 50, 51
Divisional value of phyllotaxis, estimate of the 18
Divisions, Natural 19
Dolichorrhiza 89
Don, D. 61
Donetz river 24
Doubtful species, excluded and 187
Duthie 39
Dyer (*see* Thiselton-Dyer)... 23, 51

Eastern Himalaya ... 27, 39, 47
Edentulæ 18
Edgeworth 39
Elata 87
Elburz range 24, 54
Ellis 39
Elongatæ 78
Embryo 14
Emodic division 27, 39
Endemic percentages ... 25
Equatorial flora during migrations, behaviour of ... 41
Erostrate corollas 11, 19
EROSTRES Prain 91, 168; 19, 20, 21, 22, 52, 61
Estimate of diagnostic characters 16
Euorthorrhynchæ 72
EUPHRASIEÆ ... 6, 47
Eurhyncholophæ 80
Europe ... 24, 25, 49, 51
European meridian of distribution ... 43, 45, 48, 49, 50
,, province ... 24
Eusiphonanthæ 67; 7, 61
Euxine sea 24
Exaltatæ 99
Excelsa 81; 58
Excluded and doubtful species 187
Explanation of diagram construction 42
Explanatory note on the illustrations 188

Falconer 39
Faucidentes 18
Filaments 13
Filicifolia 73; 58
Flagellares 20
Flammeæ 100
Flexuosæ 73; 58
Floral leaves 4
Flowers 4
Foliosæ 98
Forbes, E. 40
,, , F. B. 58
Fragiles 97; 58
Franchet 1, 58
Franchetiana 70
Fruit 13
Furfuraceæ 75

Galea 8
Gamble 39
Gardner 39
Garhwal 39
GEOGRAPHICAL DISTRIBUTION ... 22
Gibberæ 96
Giles 39
Gloriosæ 92
Gobi, desert of 24
Gossain Than, mountain of ... 30
Govan 39
Graciles 72
Grandiflora 93
Greenland ... 43, 44, 49, 51
Griffith 39
Groups of species 17
Gyrorrhynchæ 70; 7

Habit in diagnosis, value of ... 14, 17
,, of species, general ... 2
Hairs inside corolla tube ... 9
,, on filaments ... 12
,, on margin of lip ... 8
Hamilton 30, 39
Hay 39
Hazara 39
Hemsley ... 39, 50, 58
Herb. Griffith. 65
,, *Ind. Or. H. f. et T. T.* ... 65
,, *Wallich.* 65
,, *Wight.* 65
Heyde 39
Heyne 39
Higher subdivisions ... 18
Himalaya 25
Himalayan botany 27
,, districts, components of 39
,, division proper ... 26, 39
,, province ... 25, 27
,, ,, , BIDENTATÆ of the ...
,, ,, , colour-distribution in the ... 47
,, ,, , conspectus of the ... 39
,, ,, , investigators of the ... 39

Hindu-kush ... 25, 26, 27, 39
Hirsutæ 100; 5
Hirtella 89
HISTORICAL chapter ... 1
„ ACCOUNT OF INDIAN SPECIES ... 61
Hoffmeister 39
Hood of corolla 8
Hooker 1, 15, 17, 39, 40, 41, 43, 49, 62
Hunan 26
Hupeh 58
Hyporthorrhynchæ ... 83
Hyposiphonanthæ ... 74; 61
Hypothesis of alternating migrations ... 40
„ of permanence ... 50, 52
Hypothetical limits of Himalayan districts 31

Identity of habit in different species 14
Illustrations, explanatory note on the 188
India 26
INDIAN SPECIES, HISTORICAL ACCOUNT OF THE 61
Indo-China 27, 50
Indo-Chinese division 26, 27, 34, 39, 47, 50
Indus river ... 25, 27, 28, 39
Inflorescence 4
Infraction of corolla-tube ... 8
Insertion of stamens ... 6
Integrifolia 70
Intermediate (Temperate) flora 42, 51
Intra-arctic cleavage in distribution 43, 49
Investigators of Himalayan botany 39
Irrawaddy river 34, 39
Isothermal line of 15°C. ... 23, 188

Jablonoi range 24
Jacquemont 39, 58
Jæschke 39
Japan ... 23, 24, 25, 43, 51
Japanese meridian of distribution 43, 45, 47, 48, 49, 50, 54
„ province 24

Kabul 39
Kachen 39
Kafiristan 27, 39
Kamaon district ... 29, 39, 54
Kamstchatdale hills ... 25
Kamstchatka ... 23, 49, 51
Kansu 50
Karakoram range ... 25, 27, 39
Karnalli river ... 27, 29, 30, 39
Kashmir ... 39, 51, 54
Khasia hills ... 34, 39, 51
Khoondoung range ... 39
King 39
Klein 39
Klotzsch 61
Kœnig 39
Kuban river 24
Kuen-lun range 24, 27
Kullu 39
Kuma river 24
Kunawar 39
Kurile islands 25
Kurz 39
Kwei-tschou ... 35, 39, 51

Labium 8
Labrador ... 44, 49, 51
Lachnoglossæ 81
Ladak 39
Lahul 39
Lange ... 15, 16, 187
Lapland 43
Leaves 3
Limbus of calyx 5
„ of corolla 6
Limnogena 98
Linnæus 1, 18
Lip of corolla 8
Lobes of lip 8
Longicaulis 85
Longifloræ 67; 58
Longipedes 74
LONGIROSTRES Maxim. 67, 109; 8, 10, 19, 21, 22, 52, 53, 61
„ VERTICILLATÆ 22
Lushai hills 39
Lyratæ ... 85; 22, 47

Macrae 39
Macranthæ 69; 7
Madden 39
Malay peninsula 34
Mandshuria 24
Manipur 39
Manitoba 24
Mann 39
Map 22
„ , note on the 188
Margin of calyx 5
„ of galea 8
„ of labium 8
Maries 39, 39
Masters, J. W. 39
Maximowicz ... 1, 10, 18, 22, 23, 38, 47, 58, 62

Mediterranean basin ... 50, 51
Megalanthæ 68
Mekong river ... 34, 35, 39
Melampyrifolia 86
MELIACEÆ 50
Menas river 39
Meridians of distribution ... 43
Mexico 24, 50
„ , New 44
Microchila 93
Microphyllæ 76
Migrations, hypothesis of alternating 40
Miri (Himalaya) 39
Mishmi hills 39
Mongolia 24
Moon 39
Moorcroft 39
MORPHOLOGY 2
Multiple meridional distribution 51
Muni Pahar range 39
Muscicolæ 68
Mustagh range 27
Myriophyllæ ... 84; 20, 22

Nan-ling range 25, 39
Nan-shan „ 24
Natal 42
Natural disposition of sections 19
„ subdivisions of the genus 19, 44
Nepal ... 27, 39, 54
„ district 30, 39
Nervation of calyx ... 5
„ of corolla ... 10
New Granada (*see* Colombia) ... 24, 44
„ Mexico 44
Nilghiri hills ... 38, 39, 50
Northern Andes 27, 44
„ Flora 22
„ temperate-intermediate flora ... 22
Norway 43
Note on the illustrations, explanatory 188

Obliquity of lip 10
Okotsk 49
Oldham 39
Oliganthæ 75; 20
Ophiocephalæ 93
Opposite-leaved species 11, 18, 49
Oppositifoliæ (§) 70
„ (§§§) ... 85
Origin of BIDENTATÆ ... 57
„ of LONGIROSTRES 53
„ of opposite-leaved species 49
ORTHORRHYNCHÆ Prain 70, 129; 6, 7, 8, 9, 10, 20, 21, 22, 47, 52
Osteomeles 50
Ovary and ovules 12
Oxycarpæ 74; 58

Palustres 90
Panjab (Himalaya) district ... 28, 39
Patkoi range 39
Paucifoliatæ 80
Pectinatæ 71
Pedicularis 66
„ abrotanifolia *M. Bieb.* 96

Pedicularis *abrotanifolia* Herb. Ind. Or. ... 171
" acaulis *Wulf.* 91; 3, 50, 120
" achilleæfolia *Steph.* 88; 26
" aduncа *M. Bieb.* ... 90
" alaschanica *Maxim.* 164; 84; 2, 3, 4, 8, 14, 32, 62, 64
" Alberti *Regel* 99, 181, 183
" albiflora *Prain* 155; 79; 2, 11, 12, 32, 50, 63
" Alopecuros *Franchet* 71, 35
" *alpina caule simplici &c.* Haller 63, 182
" altaica *Steph.* ... 87; 11
" amœna *Ad.* ... 94; 49
" *amœna* Maxim. ... 173
" anas *Maxim.* 93; 15, 37
" angustifolia *Benth.* 90; 4
" apodochila *Maxim.* 88
" armata *Maxim.* ... 67; 37
" Artselæri *Maxim.* 91; 3, 50, 170
" asparagoides *Lapeyr.* 87
" asplenifolia *Flœrke* 79; 15, 16, 50, 156, 157
" *asplenifolia* Baumg. 186
" *asplenifolia* Wall. 157; 65
" *aspleniifolia* Hook. f. 157; 16
" *aspleniifolia* VAR. *albiflora* Hook. f. 156
" *aspleniifolia* VAR. *pubescens* Hook. f. 121
" atropurpurea *Nordm.* 99
" atrorubens *Schleich.* 78; 18
" attollens *A. Gray* 80; 44, 50
" *avana* Wall. ... 187
" axillaris *Franchet* 74; 35

" Barrelieri *Reichb.* 78
" bella *Hook. f.* ... 120; 69; 2, 3, 4, 5, 7, 32, 62, 64
" bicornuta *Klotzsch* 115; 68; 2, 5, 7, 11, 12, 28, 29, 30, 62, 63
" *bicornuta* × *megalantha* Prain ... 117
" bidentata *Maxim.* 67; 37
" binaria *Maxim.* 84; 15 37, 163
" Bourgeaui *Maxim.* 98
" brachyodonta *Schloss. et Vukot.* ... 87
" brachystachys *Bunge* 81
" bracteosa *Benth.* ... 98
" brevifolia *Don* 134; 72; 2, 3, 14, 29, 30, 31, 35, 62, 65
" *brevifolia* Hook. f. 142
" *Brunoniana* Wall. 137; 65

Pedicularis *cabulica* Benth. 168; 16, 20, 61, 64
" cadmea *Boiss.* 98
" cæspitosa *Sieber* 78
" campestris *Griseb. et Schrenk.* 88
" canadensis *Linn.* 91
" capitata *Ad.* ... 92; 44
" carnosa *Wall.* 151; 77; 2, 3, 4, 5, 8, 9, 12, 13, 15, 17, 29, 30, 31, 32, 34, 51, 61, 62, 63, 64, 65.
" caucasica *M. Bieb.* 98
" *caule simplici &c.* Haller ... 63, 182
" cenisia *Gaud.* 78
" centranthera *A. Gray* ... 92
" cephalantha *Franchet* ... 75
" Chamissonis *Stev.* 84; 43, 44, 49, 164
" cheilanthifolia *Schrenk* ... 171; 93; 2, 3, 5, 28, 29, 62
" chinensis *Maxim.* 67; 14, 112
" chorgossica *Rgl et Winkl.* ... 86
" chumbica *Prain* 144; 73; 2, 7, 32, 63
" Clarkei *Hook. f.* 161; 83; 2, 3, 4, 5, 8, 13, 15, 17, 32, 62, 64.
" collata *Prain* 177; 97; 2, 20, 32, 63
" Collettii *Prain* 154; 77; 2, 4, 5, 6, 8, 12, 15, 35, 63
" comosa *Linn.* 88; 50
" compacta *Steph.* 82
" comptoniæfolia *Franchet* ... 166; 86; 2, 4, 5, 14, 35, 63, 64
" condensata *M. Bieb.* 98
" confertiflora *Prain* 142; 72; 2, 3, 12, 63
" conifera *Maxim.* 85; 58
" contorta *Benth.* 81
" corymbosa *Prain* 152; 77; 2, 3, 6, 8, 12, 15, 17, 34, 35, 63
" *corymbosa* Pallas 153
" cranolopha *Maxim.* 67
" craspedotricha *Maxim.* ... 82; 37
" crassirostris *Bunge* 84
" crenata *Maxim.* 77; 15, 35, 151, 152
" crenulata *Benth.* 91
" cristata *Maxim.* 71; 37
" curvipes *Hook. f.* 151; 76; 2, 4, 5, 13, 32, 34,

Pedicularis curvituba *Maxim.* 84, 165
" Daltoni *Prain* 121; 69; 2, 3, 7, 32, 63
" Davidi *Franchet* 74; 37
" debilis *Franchet* 72; 35
" Delavayi *Franchet* 67; 35
" deltoidea *Franchet* 85; 35
" densiflora *Benth.* ... 98
" densispica *Franchet* 96; 35
" denudata *Hook. f.* 176; 96; 2, 4, 14, 32, 62
" dolichorrhiza *Schrenk* 167; 89; 2, 4, 5, 13, 14, 16, 20, 28, 29, 57, 61, 62, 64, 65
" elata *Willd.* ... 87
" elegans *Ten.* ... 78
" elephantoides *Benth.* 117; 68; 2, 7, 12, 29, 62, 64
" *Elephas* Benth. ... 110
" *Elephas* Boiss. ... 115; 113; 65, 110
" elongata *Kerner* ... 78
" Elwesii *Hook. f.* 127; 69; 2, 5, 7, 11, 15, 32, 36, 62, 64
" euphrasioides *Steph.* 90; 43, 44, 51
" exaltata *Besser* ... 99
" excelsa *Hook. f.* 158; 81; 2 3, 4, 8, 10, 13, 32, 44, 50, 62, 64
" *eximia* Watt 116; 63

" Fetisowi *Regel* ... 71
" filicifolia *Hemsl.* 73; 58
" Filicula *Franchet* 79; 36
" fissa *Turcz.* ... 87
" *fissa* Hook. f. ... 168
" flagellaris *Benth.* 150; 76; 2, 32, 61, 62, 65
" flammea *Linn.* 100; 15, 43, 44, 183
" *flammea* Oeder 182; 62
" flava *Pallas* ... 88
" flexuosa *Hook. f.* 143; 73; 2, 3, 4, 7, 8, 9, 32, 62, 64, 174
" foliosa *Linn.* ... 98; 15
" *foliosa* Gunner ... 182
" fragilis *Prain* ... 178; 97; 2, 4, 5, 8, 11, 13, 20, 34, 63, 64
" Franchetiana *Maxim* 70; 37
" Friderici Augusti *Tommas.* ... 88; 17
" Furbishiæ *S. Wats.* 90

Pedicularis furfuracea *Wall.* 147; 75; 2, 5, 8, 11, 12, 14, 15, 16, 31, 32, 62, 64, 65
" *furfuracea* VAR. *integrifolia* Hook. f. ... 148; 16
" Gammieana *Prain* 162; 84; 2, 15, 32, 63
" Garckeana *Prain* 122; 69; 2, 7, 32, 63
" geminata *Portenschlag* 79, 156
" gibbera *Prain* 174; 96; 2, 3, 4, 12, 13, 14, 32, 63
" globifera *Hook. f.* 170; 93; 2, 8, 15, 32, 62, 64
" gloriosa *Biss. et Moore* 92; 51
" gracilis *Wall.* 137; 72; 2, 3, 4, 5, 9, 10, 28, 29, 30, 31, 32, 34, 35, 36, 51, 58, 62, 65
" græca *Bunge* ... 88
" grandiflora *Fisch.* 93
" grœnlandica *Retz.* 80; 43, 44, 50
" gruina *Franchet* 149; 76; 2, 5, 6, 7, 8, 9, 35, 36, 63, 64
" gyroflexa *Vill.* ... 78
" gyrorrhyncha *Franchet* ... 70; 36

" Henryi *Maxim.* 76; 9
" heterodonta *Panč.* 87
" Heydei *Prain* 140; 72; 2, 3, 4, 29, 63
" *himalayca* Klotzsch 114; 63
" hirsuta *Linn.* 100; 43, 44
" *hirsuta* Sm. ... 182
" hirtella *Franchet* 89; 58
" *Hoffmeisteri* Hook. f. ... 113
" *Hoffmeisteri* Klotzsch 118; 63
" *Hookeriana* Aitch. 114
" *Hookeriana* Wall. 114; 65
" Howellii *A. Gray* 82; 4

" incarnata *Jacq.* 78
" *incarnata* × *recutita* Steining. 18
" incurva *Benth.* 80; 44, 50
" ingens *Maxim.* 83; 37
" instar *Prain* 136; 72; 2, 3, 33, 63, 64
" integrifolia *Hook. f.* ... 128; 70; 2, 5, 7, 11, 33, 58, 62, 64
" interrupta *Steph.* 86

Pedicularis kansuensis *Maxim.* 94; 37, 49
" Keiskei *Franchet Savat.* ... 73
" Kingii *Prain* 179; 97; 2, 3, 4, 6, 8, 10, 12, 33, 63, 64

" *labellata* Benth. 114
" *labellata* Boiss. 114
" *labellata* Hook. f. 113
" *labellata* Jacquem. 110; 16, 63
" lachnoglossa *Hook. f.* 159; 81; 2, 3, 4, 8, 13, 14, 33, 36, 50, 62, 64
" læta *Stev.* ... 88; 24
" lanata *Willd.* 100; 43, 44
" lanceolata *Michx* 77, 154
" Langsdorfii *Fisch.* 100; 20, 44
" *lanigera* Wall. 134; 66
" lapponica *Linn.* 82; 43, 44
" lasiophrys *Maxim.* 82; 37
" lasiostachys *Bunge* 88
" *leiandra* Franchet 58
" leptorhiza *Rupr.* 96
" leucodon *Griseb.* 88
" likiangensis *Franchet* 94; 36
" limnogena *Kerner* 99
" lineata *Franchet* 94; 36
" longepetiolata *Franchet* ... 75; 36
" longicaulis *Franchet* ... 85; 36
" longiflora *Rudolph* 112; 67; 2, 5, 7, 8, 12, 13, 14, 15, 28, 29, 30, 33, 54, 61, 62, 63
" longipes *Maxim.* 74; 37
" lusitanica *Link et Hffgg* ... 90; 17
" lutescens *Franchet* 85; 36, 165
" lyrata *Prain* 165; 85; 2, 3, 33, 63, 64

" macilenta *Franchet* 74; 58
" macrantha *Klotzsch* 125; 69; 2, 3, 7, 9, 10, 16, 30, 62, 63, 64
" macrosiphon *Franchet* ... 68; 37, 50, 119
" mandshurica *Maxim.* 88
" Maximowiczii *Krasn.* 92
" megalantha *Don* 117; 68; 2, 5, 7, 11, 14, 17, 29, 30, 31, 33, 62, 63, 65
" *melampyriflora* Franchet ... 58

Pedicularis melampyrifolia *Franchet* 86; 36,
" Menziesii *Benth.* 93; 43, 44, 49
" mexicana *Zuccar.* 81
" microcalyx *Hook. f.* ... 149; 75; 2, 33, 62, 64
" microchila *Franchet* ... 93; 36
" mixta *Gren. et Godr.* 78
" mollis *Wall.* 176; 96; 2, 28, 29, 30, 31, 33, 62, 63, 64, 65
" moschata *Maxim.* 96
" moupinensis *Franchet* ... 73; 37
" muscicola *Maxim.* 68; 60, 67, 120
" myriophylla *Pallas* 84; 11, 165

" nasuta *M. Bieb.* 87; 47
" nepalensis *Prain* 124; 69; 2, 3, 7, 33, 63
" Nordmanniana *Bunge* 78; 50
" occulta *Janka* ... 88
" *ochroleuca* Duthie 126; 16, 64
" odontophora *Prain* 166; 78; 2, 3, 8, 10, 12, 33, 63, 162
" Oederi *Vahl* 181; 100; 2, 4, 5, 8, 12, 14, 16, 17, 28, 29, 30, 31, 43, 44, 51, 61, 62, 63, 64, 65
" *Olgæ* Regel ... 180
" oligantha *Franchet* 75; 36
" Oliveriana *Prain* 133; 71; 2, 33, 63
" olympica *Boiss.* ... 100
" ophiocephala *Maxim.* 172; 93; 2, 30, 63, 64
" Orizabæ *Cham. et Schlecht.* 81
" ornithorrhyncha *Benth.* 79
" orthantha *Griseb.* 99
" *orthantha* Maxim. ... 180
" oxycarpa *Franchet* 74; 36, 58

" palustris *Linn.* 90; 43, 44, 51
" Pantlingii *Prain* 148; 75; 2, 15, 33, 63
" Parryi *A. Gray* 81; 14, 50, 160
" *patens* Royle ... 181
" pectinata *Wall.* 129; 71; 2, 3, 6, 7, 8, 9, 10, 12, 14, 15, 28, 29, 30, 62, 64, 65
" *pectinata* Aitch. 132
" " VAR. *pyramidata* Hook. f. 130

Pedicularis pedicellata *Bunge* 79; 43, 44, 47, 50

" **Perrottetii** *Benth.* 119; 68; 2, 5, 8, 12, 50, 61, 62, 63, 64, 67

" petiolaris *Ten.* 88, 17

" physocalyx *Bunge* 88

" pilostachya *Maxim* 95

" platyrrhyncha *Schrenk* 86

" plicata *Maxim.* 95; 37

" **polygaloides** *Hook. f.* 175; 96; 2, 33, 62, 64

" polyphylla *Franchet* 76; 9, 17, 36

" pontica *Boiss.* ... 95

" **porrecta** *Wall.* 141; 72; 2, 29, 30, 33, 36, 58, 62, 65

" *Portenschlagii* Saut. 157

" Potanini *Maxim.* 79

" **Prainiana** *Maxim.* 162; 83; 2, 3, 4, 8, 15, 17, 33, 63, 64

" proboscidea *Stev.* 81

" procera *A. Gray* 90

" **Przewalskii** *Maxim.* 120; 69; 2, 3, 7, 33, 37, 62, 64

" *punctata* Dene. 114; 63

" **pycnantha** *Boiss.* 179; 98; 2, 3, 8, 11, 13, 14, 15, 16, 17, 28, 29, 62, 64

" pygmæa *Maxim.* 95

" **pyramidata** *Royle* 132; 71; 2, 8, 9, 15, 28, 29, 62, 64

" *pyramidata* Duthie 132

" *pyramidata* Herb. Ind. Or. ... 130

" pyrenaica *Gay* 78

" racemosa *Doug.* 77

" recurva *Maxim.* 81; 36, 37

" recutita *Linn.* ... 78

" refracta *Maxim.* 94; 24, 36, 49

" **Regeliana** *Prain* 169; 91; 2, 3, 8, 33, 50, 63

" resupinata *Linn.* 77; 4, 24, 51

" **rex** *Clarke* 167; 86; 2, 3, 4, 5, 6, 9, 13, 34, 35, 36, 51, 63, 64

" **rhinanthoides** *Schrenk* 109; 67; 2, 7, 14, 15, 16, 28, 29, 30, 33, 36, 37, 62, 63, 64

" *rhinanthoides* Hook. f. ... 110; 117

" rhodotricha *Maxim.* 82; 30, 37, 161

" rigida *Franchet* 86; 36

" Roborowskii *Maxim.* 71; 37

Pedicularis **robusta** *Hook. f.* 123; 69; 2, 7, 9, 33, 62

" rosea *Wulf.* ... 99

" rostrata *Linn.* 78; 50, 156

" **Roylei** *Maxim.* 173; 93; 2, 3, 14, 29, 30, 33, 37, 62, 64

" rubens *Steph.* ... 88

" rudis *Maxim.* 83; 37 162

" *rudis* Prain ... 162

" rupicola *Franchet* 95; 36

" sajanensis *Steph.* 98

" salviæflora *Franchet* ... 97; 58

" sarawschanica *Regel* 87

" Sceptrum Carolinum *Linn.* 92; 51

" schizocalyx *Lange* 87

" **schizorrhyncha** *Prain* ... 163; 84; 2, 3, 8, 13, 33, 63

" Scolopax *Maxim.* 71

" scopulorum *A. Gray* 87; 43, 44, 51

" **Scullyana** *Prain* 127; 69; 2, 7, 10, 11, 31, 33, 63, 64

" *Semenowi* Regel 180; 16, 64

" semibarbata *A. Gray* 92

" semitorta *Maxim.* 71, 133

" sigmoidea *Franchet* 67; 36

" sima *Maxim.* 97; 37

" **siphonantha** *Don* 113; 67; 2, 5, 7, 8, 10, 12, 14, 15, 28, 29, 30, 31, 33, 37, 54, 62, 63, 64, 65

" *siphonantha* Hook. f. ... 110

" songarica *Schrenk* 87

" **sp.** *Prain* ... 187; 34

" *sp.* Aitch. ... 180

" *sp.* Benth. ... 180

" *sp.* Clarke ... 178

" *sp.* n. 20 Herb. Ind. Or. ... 121

" *sp.* n. 30 Herb. Ind. Or. ... 148

" *sp.* Retz. ... 182

" *sp.* Schmid ... 154; 63

" *sp.* Wall. ... 183; 65

" spicata *Pallas* 94

" striata *Pallas* 90; 12

" *stricta* Wall. 137; 65

" strobilacea *Franchet* ... 67; 58

" subrostrata *C. A. Mey.* ... 86

Pedicularis sudetica *Willd.* 87; 43, 44, 51

" sumana *Spreng.* 99; 15

" superba *Franchet* 86; 13, 36

" sylvatica *Linn.* 90; 17, 24, 51

" szetschuanica *Maxim.* 94; 37

" Tartinowi *Maxim.* 84

" **tenuicaulis** *Prain* 144; 73, 2; 3, 33, 63

" **tenuirostris** *Benth.* 131; 71; 2, 3, 4, 8, 15, 28, 29, 30, 62, 64

" *tenuirostris* Aitch. 132

" tenuisecta *Franchet* 76; 9, 17, 36

" ternata *Maxim.* 95

" tianschanica *Rupr.* 71

" torta *Maxim.* ... 74; 37

" **trichoglossa** *Hook. f.* 160; 82; 2, 3, 4, 10, 13, 30, 33, 62, 64

" tristis *Linn* ... 82; 37

" tsangchanensis *Franchet* ... 80; 36, 157

" tuberosa *Linn.* ... 78

" *tubiflora* Fisch. ... 112

" *tubiformis* Klotzsch 112; 63

" uliginosa *Bunge* 88

" uncinata *Steph.* 81; 20

" vagans *Hemsl.* ... 81; 58

" venusta *Schang.* 87

" verbenæfolia *Franchet* 72; 36

" *versicolor* Royle 183

" " Wahlenb. 182; 63, 64

" verticillata *Linn.* 94; 5 14, 15, 17, 37, 43, 44, 48, 49, 51, 174

" *verticillata* Benth. 173

" *verticillata* Walp. 173

" Viali *Franchet* ... 80; 58

" villosa *Ledeb.* ... 87; 4

villosula *Franchet* 72; 58

" violascens *Schrenk* 94; 49

" *virescens* Wahlenb. 182

" **Wallichii** *Bunge* 156; 80; 2, 3, 4, 15, 31, 33, 62, 65

" Wilhelmsiana *Fisch.* 98

" yezöensis *Maxim.* 77, 154

" yunnanensis *Franchet* 80; 36, 158

" **zeylanica** *Benth.* 153; 77; 2, 3, 8, 9, 12, 15, 50, 61, 62, 63, 64, 65

Pegu Yomah 39
Pe-ling range 25
Perennial species 2
Perm 24
Permanence, hypothesis of comparative 50, 52
Perny 39
Perrottet 39
Persia ... 24, 27, 54
Persian highlands 27
Personatæ 18
Phyllotaxis 3, 11, 18
„ , distribution by ... 47
Physiographical components of Himalayan province ... 39
Pilostachyæ 95
Placentation 12
Plains of India 26
Plates, note on the ... 188
Platyrrhynchæ 86; 22
Plicatæ 95
Political components of Himalayan province 39
Pontica 95
Position of the Yunnan district 37
Prain 39
Presence of genus in S. India... 50
Principle of diagram construction 42
Proboscideæ 81
Province, American ... 24
„ , Caucasus ... 24
„ , Chinese 24
„ , Circumpolar ... 23
„ , European ... 24
„ , Himalayan ... 25
„ , Japanese ... 24
„ , Siberio-Turkestan ... 24
„ , use of the term ... 23
Pseudasplenifolia 84
Pseudocæspitosæ 84
Pumiliones 69
„ , relationhips of *Robustæ* and ... 125
Pygmæa 95

Racemifloræ 90
Racemosæ 77
Radical leaves 3
Radicle 14
Recutitæ ... 78; 19, 20
Reductions of Indian herbaria 65
Region, disuse of the term ... 23
Relationships of BIDENTATÆ ... 56
„ of leaves and root 3
„ of *Robustæ* and *Pumiliones* ... 125
Rhinanthoides 67
Rhinanthus bifidus Ham. ... 151; 61
Rhizome 3
RHYNCHOLOPHÆ Bunge 74; 146; 6, 7, 8, 9, 20, 21, 22, 47, 52, 53, 54, 61
Rigidæ 86
Robustæ 69
Rocky mountains 25, 44
Root 3
Roseæ 99
Rostratæ ... 78; 12, 18, 54
Rostrate corollas 11, 19
Röttler 39
Roxburgh 39
Royle 39
Rubus 17
Rudes 83
Rumelia 49
Rupert's Land 44, 51

Safed-koh range 39
Sajan range 24
Salviæflora 97; 58
Sandwich islands 59
San-po river 24, 27
Saxifraga 17
Scandinavia 24, 51
Scandinavian Alps... ... 25
Sceptra 91
Schlich 39
Schmid 39
Schöw 26
Schrenk 61
Scully 30, 39
Sections ... 18, 19, 20, 21
„ , distribution by ... 44, 52
Seeds 13, 17
Semitortæ 71
Series 18
Shan hills 39
„ plateau district ... 34, 39
Shape of labium 8
Siam 39
Siberia ... 23, 24, 25, 51, 54
Siberio-Turkestan meridian of distribution ... 43, 45, 48, 49, 54,
„ mountain-system 25
„ province ... 24
Sierra Nevada 49
Sikkim district 31, 54
„ frontier 30
„ proper 31, 39
„ -Bootan (Himalaya) ... 39
„ -Chumbi („) ... 27
Sima 97
Similarity of floral structure in different species 15
Simons 39
SIPHONANTHÆ Benth. 67, 109; 4, 6, 7, 8, 9, 11, 19, 21, 22, 47, 52, 61
Sirmur 39
Sisymbrium pannonicum Jacq. 185
Sitka island 47
Sketch-map of the Northern Hemisphere 22
Soongaria 24
South Africa 42
„ Indian district ... 38, 39
„ „ division ... 27, 39
Southern India ... 27, 38, 60
„ intermediate flora ... 42
Spain 42
Specific diagnosis 16
Spiral inflorescence ... 10
Spiti 39
Spur of disc 6
Staminal hairs 13
„ insertion 9
Stanovoi range 25
Steininger 17, 18
Stem 3
Steven 1, 10, 18
Stewart 39
Stigma 13
Stoliczka 39
Strachey 39
Striatæ 89; 68
Striatæ 90
Structure of corolla, distribution by 45
Style 12
Subbidentatæ 97
Subdivisions of genus, higher ... 18, 44
Subsurrectæ 80; 68
Sudeticæ 87
Superbæ 86; 22
Surrectæ ... 80; 44, 58
Sutlej river ... 27, 28, 29, 39
Synnema aranum Benth. ... 187
Systematic history of genus ... 1
Szetschuan district 37, 49, 50, 54, 58

Table (20) Chronology of the Indian species ... 62, 63
„ (5) Comparison of systems of classification ... 22
„ (17) Conspectus of the Himalayan province 39
„ (18) Distribution in Alaska and Greenland 44
„ (13) Ditto in Assam-Burma uplands ... 34
„ (10) Ditto in Kamaon district 30
„ (11) Ditto in Nepal district 31
„ (9) Ditto in Panjab Himalaya 29
„ (14) Ditto in Shan plateau district ... 35
„ (12) Ditto in Sikkim-Chumbi Himalaya ... 32, 33
„ (16) Ditto in Szetschuan ... 37, 38
„ (8) Ditto in trans-Indus district ... 28
„ (15) Ditto in Yunnan highlands 35, 36
„ (6) Ditto of genus, general 25
„ (7) Ditto of Himalayan species ... 27
„ (19) Ditto of sections ... 52

Table (1) Habit of Indian species 2
" (21) Iconography of Indian species ... 63, 64
" (22) Reductions of the Griffithian species 65
" (23) Ditto of the Wallichian Herbarium 65
" (3) Relationship of colour to structure ... 11
" (4) Ditto of phyllotaxis to structure ... 18
" (2) Variation in length of corolla-tube ... 7
Tabula affinitatum 66
" " , note on the 188
Taurus range 24
Teeth of calyx 5
Tehri 39
Temperate complements of provinces 51
Tenuirostres 71
Testa 14
Texture of corolla 10
Thalictrum 17
Thiselton-Dyer 23, 51
Thomson, T. 39
Thwaites 39
Tianshan range 24, 27
Tibet ... 25, 26, 27
Tonquin 35, 39
Torenia incisa Heyne 154; 61, 65
Tournefort 1
Trans-Indus district ... 27, 39
Trimen 39
Tristes ... 82; 19, 20
Tube of calyx 5
" of corolla 6, 8
Turkestan 24, 27
Turritis hirsuta Jacq. ... 185

United States 24
Ural mountains 24, 25

Vagans 81; 58
Variations in colour of corolla 13
Veræ (§§§§) 87
Verticillatæ ... 94; 18, 22
VERTICILLATÆ ... 22, 47, 58
Vicary 39
Volga river 24

Walker 39
Wallace 39, 50
Wallich ... 30, 39, 61
Wallichian herbarium ... 65
" "Region" (of *Schöw*) 26
Watt 39, 62
Western Ghauts 38, 39
" Himalaya 27, 39, 47
Wight 39, 61
Willdenow 1, 18
Winterbottom 39

Yang-tse-kiang river 25, 26, 35, 39
Yarkand 24
Yomadoung range 34, 39
Yomah, Pegu 39
Yunnan ... 25, 32, 39, 51, 58
" district annexed to Himalayan province 37
" excluded from descriptive part of paper ... 38
" highlands district ... 35, 39

Zonal distribution 42, 50, 51

Reg. No. 5009J—250—11-10-90.

THE

MAGNOLIACEÆ

OF

BRITISH INDIA.

BY

GEORGE KING, M.B., LL.D., F.R.S., C.I.E.,

Superintendent of the Royal Botanic Garden, Calcutta.

CALCUTTA:

Printed at the Bengal Secretariat Press.

1891.

THE

MAGNOLIACEÆ

OF

BRITISH INDIA,

BY

GEORGE KING, M.B., LL.D., F.R.S., C.I.E.,

Superintendent of the Royal Botanic Garden, Calcutta.

I was led to undertake this account of the Indian species of *Magnoliaceæ* on account of our very imperfect acquaintance with the species which are found in the provinces of Assam, Cachar, and Sylhet. Most of these are noble trees, and many of them yield useful timber; nevertheless they have hitherto been but little known botanically. Thanks to the kindness of Mr. Gustav Mann, Conservator of Forests for Assam, and to Mr. S. Peal, who for many years has been resident in that province, I have (in response to my appeal for help) been put in possession of excellent materials which enable me to give a fuller account than has hitherto been possible of the older species, as well as to add some new ones to the Indian Flora. Collectors sent to the Andamans and to the Province of Perak, also brought sufficient material of certain new species to enable me to give an account of, and to figure them. But amongst the Perak collections there are imperfect specimens of nearly ten species which, although apparently new, I cannot venture to name until completer material shall be obtained.

In respect of the morphology of the order, I have nothing to add to the full accounts already given by MM. Trecul, Baillon, and other botanists. The characteristic stipules of the group *Magnoliæ*, being very fugacious, are rarely seen in herbarium specimens, and but little use has been made of them in distinguishing species. In a good many cases I have been able to describe them. They are long, narrow, and convolute; and they completely enclose the bud of the next higher leaf, the apex of the axis, and the flower-bud (if there be any). The flower-bud is in turn covered by a large spathe-like bract which completely envelopes it. This spathoid bract often affords excellent specific characters; but as it is early forced off by the expansion of the flower, it is rarely seen in herbarium specimens.

As regards the limitation of genera of the sub-order *Magnoliæ*, I think there are good grounds for the opinion of Baillon that *Michelia* and *Manglietia* should both be merged in

Magnolia. *Michelia*, as usually defined, is distinguished from *Magnolia* practically by the single character of having its gynophore stalked, while that of *Magnolia* is sessile. But, as a matter of fact, two species of Indian *Magnolia*, viz. *M. Griffithii* and *Pealii*, have distinct, although short, stalks to their gynophores; the presence or absence of a stalk to the gynophore cannot therefore be regarded as an absolute character. The ripe fruit, in many Indian species of *Magnolia*, is elongated rather than ovoid, just as in *Michelia;* and the solitary practical distinction that I can find between the *Magnolias* with elongated fruits and *Michelia* is that, in the former, the individual carpels are much crowded; whereas in *Michelia* they are laxly packed or even distant from each other. The Indian *Magnolia globosa* and many of the non-Indian species have ovoid fruits, in shape resembling those of *Manglietia*. The latter, although in other respects agreeing with *Magnolia*, is however separated off from that genus because its ovaries have three or more ovules, whereas those of *Magnolia* have never more than two. But although a difference in the number of ovules is thus considered sufficient to separate *Magnolia* from *Manglietia*, uniformity in the number of ovules is not considered necessary in the genus *Michelia;* some of the species of which have only two, while others have three or more, and one (*nilagirica*) has *five* or, according to some observers, as many as *eight* ovules. The mode of dehiscence of the individual carpels in the three genera just mentioned is dorsal; and the fact of ventral dehiscence (or of indehiscence) in a few species which otherwise have the characters of *Magnolia*, has been considered a sufficient reason for the formation of the genus *Talauma* for their reception. There is, in my opinion, more justification of the retention of *Talauma* which M. Baillon, however, would also reduce to *Magnolia*. I go so far with M. Baillon as to think that instead of keeping up the genera *Michelia* and *Manglietia*, it might be better to rearrange the species included in them as sections of the older genus *Magnolia*. In the following pages I have not, however, done anything of the kind. I have not only kept these old genera up, but I have added some species to each! This may be inconsistent; but it disturbs no synonymy, and it is really a matter of small importance whether (where large numbers of species have not to be dealt with) groups be treated as small independent genera, or as sections of one larger genus.

MAGNOLIACEÆ.

Trees or shrubs, sometimes climbing, often aromatic, the wood-tissue with glandular markings. *Leaves* alternate, quite entire or toothed, stipulate or not. *Flowers* axillary or terminal, often showy, white, yellow or red; sometimes unisexual. *Sepals* and *petals* very deciduous, hypogynous, arranged in whorls of 3, rarely of 4. *Stamens* indefinite, hypogynous; filaments flattened or terete, free or monadelphous; anthers basifixed, adnate, the cells bursting longitudinally. *Carpels* indefinite, free or partly cohering in one whorl or in several, on an elongate axis; styles short or rarely long, stigmatose on the inner surface; ovules 2 or more, on the ventral suture, anatropous or amphitropous. *Fruit* baccate, or follicular, or of woody dehiscent carpels, which are sometimes arranged in a cone. *Seeds* solitary or few, sometimes pendulous from a long funicle; testa single and crustaceous, or double, the outer fleshy; albumen granular or fleshy and oily; embryo minute; cotyledons spreading; radicle short, blunt, next the hilum.

DISTRIB.—Chiefly natives of the tropical and temperate Asiatic mountains and United States; a few are Australian. Species about 80.

TRIBE I. *Trochodendreæ*.—Perianth absent. . . . . 1. *Euptelea*.

TRIBE II. *Winteriæ*.—Shrubs or small trees. Stipules 0. Carpels in one whorl. . . . . 2. *Illicium*.

TRIBE III. *Magnoliæ*.—Erect shrubs or trees. *Stipules* conspicuous, convolute and embracing the leaf-buds, deciduous. *Carpels* on an elongated axis.

Carpels, when ripe, separating from the sessile carpophore and dehiscing ventrally. . . . . 3. *Talauma*.

Carpels not separating from the carpophore, dehiscing dorsally.

Carpophore usually sessile; carpels closely packed.

Fruit elongate, cylindric; ovules 2 . . . . . 4. *Magnolia*.

„ ovoid; ovules 6 . . . . . 5. *Manglietia*.

Carpophore stalked; carpels distant . . . . . 6. *Michelia*.

TRIBE IV. *Schizandreæ*.—Climbing shrubs. Flowers unisexual. Leaves exstipulate.

Carpels spicate . . . . . 7. *Schizandra*.

„ capitate . . . . . 8. *Kadsura*.

1. Euptelea, *Sieb. and Zucc.*

Shrubs. *Leaves* alternate, deciduous, toothed; petiole sheathing; stipules 0. *Flowers* pedicelled, polygamo-dicœcious. *Sepals* and *petals* 0. *Stamens* 15—20, in one whorl. *Carpels* as many as the stamens, pedicelled, obovate, much compressed, winged, indehiscent; stigma sessile, decurrent from the tip to opposite the insertion of the ovule. *Fruit* of indehiscent, dry, flat-winged, 1—4-seeded carpels. *Seeds* closely packed; testa hard, coriaceous; albumen granular; embryo minute. DISTRIB.—Two species: the following and a Japanese.

1. E. PLEIOSPERMA, *Hook. fil. & Thoms. in Proc. Linn. Soc.* vii, 240, *t.* 2. Branches smooth, blotched with grey; leaf-buds enclosed in shining, dark-coloured scales. *Leaves* membranous, ovate-rotund, acute, serrate, narrowed to the base; above glabrous, beneath pale; nerves about 10 pairs, bold, oblique; length 3 to 5 in., breadth 2·5 to 3·5 in.; petiole 1·5 in., dilated at the base.—*Hook. fil. Fl. Br. Ind.* i, 39.

Mishmi Hills, near the top of Mount Thumathaga,—*Griffith.*

Except those collected by Griffith in 1837 (and they are rather imperfect), no specimens of this are extant; the figure which I give is therefore an incomplete one. This species does not differ very much from the only other as yet known, viz. *E. polyandra*, *Sieb. & Zucc. Fl. Japan* 134, *t.* 72.

PLATE 38A. Euptelea pleiosperma, *Hook. fil. & Thoms.*—Twig with leaf-bud, leaf and fruit: *of natural size.*

2. Illicium, *Linn.*

Evergreen aromatic shrubs or small trees. *Leaves* entire, pellucid-dotted. *Flowers* bisexual, solitary or fascicled, yellow or purplish. *Sepals* 3 to 6. *Petals* 9 or more,

3-to many-seriate. *Stamens* indefinite; filaments thick; anthers adnate, introrse. *Ovaries* indefinite, 1-seriate, 1-ovuled; style subulate, recurved. *Fruit* of spreading, compressed, hard follicles. *Seeds* compressed; testa hard, shining; albumen fleshy.

DISTRIB.—N. America, China, Indo-Malaya. Species about 10.

Carpels tapering to the apex, the beaks apical.	
Petals thin, narrowly oblong, many times longer than the sepals .	1. *I. Manipurense.*
Petals more or less fleshy, rotund, not much longer than the sepals.	
Filaments about as long as the anthers.	
Stamens 9 to 13; leaves often whorled	2. *I. Cambodianum.*
Filaments shorter than the anthers.	
Stamens 20 to 24; leaves lanceolate or elliptic-lanceolate	3. *I. Griffithii.*
Stamens * * * * ; leaves obovate-oblong or lanceolate	4. *I. majus.*
Carpels clavate, their beaks sub-apical; flowers sessile; fruit pedunculate .	5. *I. Simonsii.*

1. I. MANIPURENSE, *Watt MSS. in Herb. Calc.* (*in part*). A small tree (?), glabrous. *Leaves* coriaceous, rather broadly elliptic-oblong, shortly acuminate; the base cuneate; dull on both surfaces; the 6 or 7 pairs of nerves hardly visible; length 3·5 to 4 in., breadth 1·5 in.; petiole from ·5 to ·75 in. *Flowers* axillary, solitary, on slender pedicels nearly 1 in. long, bracteate at the base. *Sepals* 4 to 6, rotund. *Petals* membranous, about 18, much longer than the sepals, linear-oblong, blunt. *Stamens* about as many as the petals, shorter than the ovaries; the anthers oblong, blunt, about as long and as broad as the flat fleshy filaments. *Styles* much recurved. *Fruit* unknown.

Keyang and Ching Sow on the Manipur-Burmese frontier, at elevations of 7,000 to 9,000 feet,—*G. Watt.*

This is distinguished, amongst hitherto described Asiatic species, by its long pedicelled flowers with narrow spreading petals, in which respects it approaches the American *I. Floridanum.*

PLATE 40B. Illicium Manipurense, *Watt.*—7, flowering branch; 8, flower dissected to show petals and stamens: *of natural size;* 9, bud; 10, flower; 11, anthers; 12, ovaries: *enlarged.*

2. I. CAMBODIANUM, *Hance in Journ. Bot.* 1876, *p.* 240. A small glabrous tree. *Leaves* opposite or in whorls of 3 or 4, coriaceous, oblanceolate or obovate-lanceolate, rarely lanceolate, acuminate, entire; length of blade 3 to 4·5 in., breadth 1 to 2 in.; petiole less than ·5 in. *Flowers* red to white, ·4 in. in diam., on long, slender, axillary pedicels, solitary or in groups of 3 or 4. *Sepals* 3 or 4, rotund. *Petals* about 9, diminishing in size inwards, ovate-oblong, blunt. *Stamens* 9 to 13, in a single row; the filaments about as long as the anthers. *Follicles* 8 to 12, beaked, radiate.—*Pierre Flore Forestiere de la Cochin-Chine, t.* 4; *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 374.

Perak; in dense forests at elevations of from 3,600 to 7,000 feet.

There is some variability as to the shape and size of the sepals: sometimes they are triangular and much smaller than the petals, in other specimens they resemble the petals both in size and shape. The stamens also vary in number, but they never form more than a single row. The texture of the leaves in some plants is thin and membranous, in others almost coriaceous. It is possible there may be two species included in this.

PLATE 38B. Illicium Cambodianum, *Hance.*—1, flowering branch; 2, ripe fruit; 3, flower dissected: *of natural size;* 4, stamens, front and back; 5, circle of ovaries: *enlarged.*

3. I. GRIFFITHII, *Hook. fil. & Thoms. Fl. Ind.* 74; *Fl. Brit. Ind.* i, 40. A small glabrous tree; young branchlets with pale, shining bark. *Leaves* coriaceous, lanceolate or elliptic lanceolate, shortly acuminate; the edges slightly recurved when dry; the base acute; upper surface shining, lower dull brown when dry; the 6 or 7 pairs of nerves obscure; length 2·5 to 3·5 in., breadth ·9 to 1·4 in.; petiole about ·5 in. *Flowers* solitary, axillary or terminal, pedicellate, ·6 in. or more in diam.; the pedicels recurved, from ·5 to 1 in. long. *Sepals* about 4 or 5, rotund, acute. *Petals* fleshy, about 18 or 20, rotund, blunt, the more internal smaller. *Stamens* 20 to 24, erect, shorter than the 12 to 15 ovaries; filaments much shorter than the broad, blunt anthers. *Fruit* 1 in. in diam.; the individual carpels with a rather fleshy epicarp; endocarp woody, compressed; the style indurated and persistent and forming a terminal, sub-incurved, deltoid beak.—*Maxim. in Bull. Acad. St. Petersb.* xxxii, 480.—Illicium, *Griff. Itin. Notes* 38, 80.—*Gordonia terminalis, Wall. Cat.* 7121.

Bhotan,—*Griffith;* Khasia Hills,—*Griffith, Hooker fil., Mann;* alt. 4,000 to 5,000 feet.

PLATE 40A. Illicium Griffithii, *Hook. fil. & Thoms.*—1, flowering branch; 2, sepals; 3, petals; 4, pedicel and ovaries; 5, ripe fruit: *of natural size;* 6, anther: *enlarged.*

4. I. MAJUS, *Hook. fil. & Thoms. Fl. Brit. Ind.* i, 40. A small glabrous tree 30 feet high; branches rather stout. *Leaves* coriaceous, obovate-oblong or oblanceolate, sharply acuminate; above shining, below rather dull; nerves 9 to 12 pairs; length 4 to 6 in., breadth 1·5 to 2 in.; petiole 1 in. *Flowers* ·5 in. in diam., pedicellate, sub-terminal, solitary or in fascicles; pedicels ·75 to 1 in., lengthening in fruit. *Sepals* and *petals* orbicular, ciliate, the inner broadly oval. Filaments short and nearly as broad as the oblong anthers. *Ovaries* spreading. *Fruit* unknown.

Tenasserim in Burmah, alt. 5,500 feet, on the Thoung Gain Range,—*Lobb.*

The material of this at Kew consists of only two specimens from which the drawing I here give was made. The species is absent from the Calcutta Herbarium. The whorl of carpels represented in my figure may not belong to this species. It was kindly drawn by Mr. Hemsley, F.R.S., from a loose specimen in the Kew Herbarium, from a different collector. It represents, however, the fruit accepted by pharmacologists as that of *I. majus.*

PLATE 39A. Illicium majus, *Hook. fil. & Thoms.*—1, flowering branch: *of natural size;* 2, flower; 3, stamens; 4, individual carpels: *enlarged*—drawn from a specimen in the Kew Herbarium; 5, whorl of carpels: *of natural size*—drawn from a loose specimen communicated by Mr. Holmes, of the Pharmaceutical Society, London, to the Kew Herbarium.

5. I. SIMONSII, *Maximowicz in Bull. Acad. Sc. St. Petersb.* xxxii, 480. A small glabrous tree; the young branches pale brown. *Leaves* thinly coriaceous, elliptic-lanceolate, acuminate at apex and base; lower surface dull brown; the 6 or 7 pairs of main nerves obscure; the midrib stout; length 3·5 to 4·5 in., breadth 1·2 to 1·5 in.; petiole ·5 in. *Flowers* sub-sessile, crowded at the apices of the branches, ·8 in. in diam. when expanded. *Sepals* about 4, rotund. *Petals* 16 to 18; the exterior broadly ovate, the

interior narrowly ovate to lanceolate. *Stamens* about 18 or 20, erect, equal; the anthers oblong, obtuse, twice as long as the filaments. *Fruit* ·8 in. to 1 in. in diam., on a pedicel 1 in. long; the individual carpels clavate; the recurved styles subulate, persistent, sub-apical.

Assam; in the Naga Hills,—*Simons.*

Plate 39B. Illicium Simonsii, *Maxim.*—6, flowering branch; 7, flower (seen from below); 8, the same (from above); 9, flower dissected; 10, circle of ovaries; 11, ripe fruit: *of natural size;* 12, anther; 13, ovaries; 14, individual carpels: *enlarged.*

3. Talauma, *Juss.*

Trees or shrubs. *Leaves* and inflorescence of *Magnolia. Sepals* 3 or 4. *Petals* 6 or 8 or more, in 2 or more whorls. *Stamens* very numerous, many-seriate; anthers linear, introrse. *Gynophore* sessile. *Ovaries* indefinite, 2-ovuled, spiked or capitate; stigmas decurrent. *Carpels* woody, separating from the woody axis at the ventral suture, and dehiscing so as to leave the seeds suspended from the axis by an elastic cord; or spongy and indehiscent, confluent, but finally separating from the axis. *Seeds* of *Magnolia.*

Distrib.—Tropics of Eastern Asia, and South America; Japan. Species about 20.

Synopsis of speceis.

Sect. I.—Eu-Talauma. Carpels woody, separating from the axis at, and dehiscing by, the ventral suture.

Leaves, branches and young fruit more or less tomentose . . . . . 1. *T. lanigera.*

Glabrous.

Flowers not more than 1·5 in. long.

Flowers sub-globose; fruit globose-pyriform; carpels beaked . 2. *T. Andamanica.*

Shrubby; flowers and fruit ovoid; leaf-petioles and midribs muriculate when dry; carpels with blunt sub-recurved beaks 3. *T. mutabilis.*

Arboreous; flowers and fruit ovoid; petioles slender, smooth; carpels with stout, short, terminal beaks . . . . . 4. *T. Kunstleri.*

Flowers 2 to 3 in. long.

Sepals and outer row of petals reflexed . . . . . 5. *T. Rabaniana.*

Sepals and petals scarcely expanding . . . . . 6. *T. Hodgsoni.*

Sect. II.—Spongocarpon. Carpels spongy or corky, indehiscent, confluent; each finally separating from the woody axis and leaving a fibrous framework.

Leaves elliptic . . . . . 7. *T. spongocarpa.*

Leaves oblong-lanceolate . . . . . 8. *T. phellocarpa.*

1. T. lanigera, *Hook. fil. & Thoms. Fl. Br. Ind.* i, 40. A small tree; young leaves, petioles and branches, the peduncles, outer surface of the spathoid involucre enveloping the calyx, the ovaries, and the young fruit densely fulvous-tomentose. *Leaves* sub-coriaceous, oblong or oblanceolate, abruptly and shortly acuminate, narrowed at the base; when adult shining and glabrous except on the lower half of the midrib below; length of blade 9 to 12 in., breadth 2·5 to 4 in.; petiole 1 to 1·5 in., thickened below. *Sepals* and *petals* white, ovate, tomentose at the very base. *Ripe fruit* 3 to 4 in. long by 2 in. broad; the carpels glabrescent when quite ripe, beaked, 1·5 in. long.—*King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 372.

Perak and Malacca; in open forest on low hills.

From Miquel's description of his *T. villosa* (Fl. Ind. Bat. Suppl. 366), that species and this must be very closely allied; and, if they are identical, Miquel's name, dating 1860, must take precedence of H. f. & T.'s, which was published in 1872.

PLATE 42. Talauma lanigera, *Hook. fil. & Thoms.*—1, young leaf and spathoid hood; 2, adult leaves and young fruit; 3 and 4, flowers; 5, young fruit; 6, ripe fruit before separation of the individual carpels; 7, the same after their separation; 8, a single carpel: *of natural size;* 9, anthers: *enlarged.*

2. T. ANDAMANICA, *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 372. A glabrous shrub or small tree. *Leaves* sub-coriaceous, oblanceolate-oblong, rarely lanceolate; the apex (usually rather abruptly) acute, the base gradually narrowed to the petiole; both surfaces shining; main nerves 10 to 14 pairs, thin but prominent below; length of blade 7 to 10 in., breadth 2·5 to 3·5 in.; petiole ·5 to 1 in., expanded at the base. *Flowers* solitary, sub-globose, 1·5 in. long, on thick, terminal, annulated, pubescent peduncles 1 in. long; spathoid hood of calyx glabrous. *Sepals* 3. *Petals* 6, ovate or obovate. *Ripe fruit* globose-pyriform, 1·5 in. long; the individual carpels rhomboid, ·6 in. long and nearly as broad, beaked; seeds ·4 in. long.—*Magnolia andamanica, King MSS.*

Andaman Islands, on Mount Harriet.

In leaf this closely resembles *T. Rabaniana*, Hook. fil. & Thoms., but has smaller flowers and fruit. The individual carpels of this are not more than a third the size of those of *T. Rabaniana*, which are more than 1 in. long and narrowly oblong and not rhomboidal.

PLATE 43. Talauma andamanica, *King.*—1, branch with fully developed flower; 2, a small flower spread out; 3, ripe fruit; 4, central axis with seeds attached by their podosperms; 5, single carpels, side and back views; 6, seed,—*all of natural size.*

3. T. MUTABILIS, *Bl. Fl. Jav. Magnol. p.* 35, *t.* 10, 11, 12, fig. B. A glabrous shrub. *Leaves* oblong-lanceolate, acute at either end, slightly unequal at the base, sub-coriaceous, shining on both surfaces; nerves about 12 pairs, spreading; length of blade 5 to 8 in., breadth 2·25 to 2·75 in.; petiole ·75 to ·9 in., thickened at the base, minutely muriculate when dry, as is the midrib. *Flowers* ovoid, solitary, terminal, on annulate peduncles about 1·5 in. long; spathoid bract fuscous-villous. *Sepals* 3, broadly ovate. *Petals* 6, in 2 whorls, broader than the sepals, sometimes obovate, concave, connivent, passing from rosy-green to reddish-brown. *Ripe fruit* ovoid, 1·5 to 2 in. long, pubescent at first, ultimately glabrous; individual carpels rhomboid, lenticellate, with blunt sub-recurved beaks, ·75 to 1·25 in. long.—*Korth. in Ned. Kruik. Arch.* ii, 98; *Hook. fil. & Thoms. Fl. Ind.* i, 74; *Hook. fil. Fl. Br. Ind.* i, 40; *Miq. Fl. Ind. Bat.* i, *pt.* ii, 14; *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 373.—*Manglietia Candollei, Wall. Cat.* (not of Bl.).

In the Straits Settlements, in shady damp spots near water.

DISTRIB.—The Malayan Archipelago.

A very variable shrub of which Blume distinguishes three varieties. All the specimens I have seen from the Straits have glabrous leaves: but Blume and others describe the leaves as often pubescent or even pilose below.

PLATE 44. Talauma mutabilis, *Bl.*—1, branch with flower-bud; 2. fully developed flower; 3, ovaries; 4, ripe fruit; 5, individual carpel, ripe; 6, seeds: *of natural size;* 7, stamens: *slightly enlarged.*

4. T. Kunstleri, *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 373. A tree, 25 to 30 feet high; glabrous, except the peduncle and unripe carpels. *Leaves* oblong-lanceolate, acuminate at base and apex, thinly coriaceous, both surfaces shining; nerves 10 to 14 pairs; length of blade 6 to 9 in., breadth 1·75 to 2·5 in.; petiole ·5 to 1·25 in., slender; the base thickened. *Flowers* ovoid, terminal, solitary, scarcely expanding, ·85 in. long; peduncles erect, pubescent, annulate, 1 in. long. *Sepals* 3 and *petals* 6, scarcely exceeding the stamens, broadly elliptic, fleshy, glabrous, waxy white. *Anthers* sessile, more than ·5 in. long. *Pistils* 6 to 8, linear, pubescent. *Ripe fruit* ovoid, pointed, 1·25 in. long and ·75 in. in diam.; individual carpels ·75 to 1 in. long, with short, stout, terminal beaks.—*Magnolia Kunstleri, King MSS.*

Perak, in dense forest at elevations of from 3,500 to 4,000 feet.

Plate 41B. Talauma Kunstleri, *King.*—6, flowering branch; 7, flower-bud; 8, young and 9, mature fruit,—*all of natural size.*

5. T. Rabaniana, *Hook. fil. & Thoms. Fl. Ind.* 74. A tall tree; young branches deciduously tawny-tomentose. *Leaves* coriaceous, elliptic-lanceolate to lanceolate, shortly and bluntly acuminate, much narrowed at the base, glabrous, shining and (when dry) conspicuously reticulate; nerves about 10 pairs; length 8 to 18 in., breadth 2·75 to 6·5 in.; petiole 1·25 to 2 in. *Flowers* solitary, terminal, 2 to 2·5 in. long, on stout, annulate peduncles less than 1 in. long. Spathoid bract densely adpressed-fuscous-tomentose. *Sepals* 3; sub-orbicular, rough externally. *Petals* 9, narrower than the sepals, concave, connivent, the outer row reflexed after the fall of the sepals. *Fruit* unknown.—*Hook. Fl. Br. Ind.* i, 40.

Khasia Hills at elevations of about 4,000 feet.

Plate 46. Talauma Rabaniana, *Hook. fil. & Thoms.*—1, branch with fully-blown flower the sepals of which have fallen off; 2, flower-bud showing spathoid bract; 3, flower with sepals attached; 4, flower artificially opened up; 5 and 6, carpels and stamens,—*all of natural size.*

6. T. Hodgsoni, *Hook. fil. & Thoms. Fl. Ind.* 74. A considerable tree; all parts glabrous except the puberulous young carpels; young branches very stout, lenticellate: the youngest glaucescent. *Leaves* thinly coriaceous, oblanceolate or lanceolate-oblong, sub-acute or obtuse, much narrowed toward the base; both surfaces shining; the reticulations distinct (when dry); nerves 15 to 20 pairs; length 8 to 20 in., breadth 3 to 6 in.; petiole 1·5 to 2·5 in., slender, with a thickened base. *Flowers* solitary, terminal, ovoid, scarcely expanding, about 3 in. long; peduncle thick with 2 or 3 rings, glabrous, ·75 to 1 in. long. *Sepals* 3, ovate, obtuse, fleshy. *Petals* 6, like the sepals, the inner smaller. *Ovaries* forming a sub-globose cone much exceeding the stamens. *Fruit* ovoid, 4 to 6 in. long by about 3 in. in diam.; individual carpels numerous, woody when ripe, verrucose, narrowly and shortly beaked, nearly 1·5 in. long and (when dehisced) ·6 in. broad; the rachis woody, deeply pitted.—*Hook. fil. Fl. Br. Ind.* i, 74; *Hook. fil. and Cathc. Ill. Him. Plants, t.* 6; *Gamble Ind. Timb.* 5.—*Manglietia insignis, Wall. Cat.* 933 (addition at p. 236), not of Blume.—*? Michelia macrophylla, Don Prod. Fl. Nepal* 226.

Sikkim; Khasia and Assam Hills; at elevations of 1,400 to 5,000 feet, very common. Nepal,—*Wallich ? Vern.* "*Boramthuri.*"

PLATE 47. Talauma Hodgsoni, *Hook. fil. & Thoms.*—1, flowering branch; 2, ripe fruit; 3, rachis of carpophore; 4 and 5, individual carpels dehisced,—*all of natural size.* (*Partly copied from Hook. fil. and Cathc. Ill. Him. Plants, t.* 6.)

Sect. II.—SPONGOCARPON. Carpels spongy or corky, indehiscent, confluent; each separating when ripe from the central woody axis and leaving the fibrous curved process which attached it to the axis; seeds escaping by the decay of the carpels; sepals and petals about 12.

7. T. SPONGOCARPA, *King, n. sp.* A tree 50 to 60 feet high; young branches minutely tawny-pubescent. *Leaves* thinly coriaceous, elliptic, gradually narrowed from about the middle to the acute apex; the base rather abruptly cuneate; the edges slightly and minutely waved in the upper half; upper surface shining, glabrous, except the rufous-pubescent midrib; lower with sparse, sub-adpressed, white pubescence; main nerves 7 to 9 pairs, ascending, curving and interarching freely at some distance from the margin; rather prominent beneath as are the intermediate nerves; reticulations minute, sharp and distinct on both surfaces (when dry); length of blade 5 to 6·5 in., breadth 2·5 to 3·65 in.; petiole 1 to 1·2 in., pubescent. *Flowers* white, solitary, axillary, about 2·25 in. in diam. when expanded; pedicels stout, ·5 to ·6 in. long, pubescent like the young branches, annulate about the middle; spathoid hood of calyx tawny-pubescent; buds oblong, rather blunt; *sepals* and *petals* each 6, glabrous, oblong; the sepals obtuse when young, pointed when old: the petals shorter than the sepals and more pointed. *Stamens* about half as long as the gynœcium; the anthers with apical tails. Carpophore on a rather long woolly stalk; *ovaries* forming a narrowly cylindric cone, densely covered with white wool; the stigmas elongate, glabrous. *Fruit* sub-cylindric, rather blunt, much lenticellate, glabrous, 3 to 4 in. long and 1·3 in. in diam.; individual carpels cuneate, ·75 in. long.

Upper Burmah, on Mymyo Hill; Calcutta Botanic Garden collector No. 102.

The section *Spongocarpon* which I have ventured to form for the reception of the above two new species of *Talauma* has the same kind of spongy, indehiscent carpels as Blume's genus *Aromadendron*—justly reduced to a section of Talauma by Mr. Bentham and Sir J. D. Hooker. But in that the flowers are large; and the sepals and petals are numerous (28 to 36), whereas in this their number is only 12.

PLATE 47 *bis*. Talauma spongocarpa, *King*.—1, flowering branch; 2, ripe fruit; 3, vertical section of same; 4, fibrous framework of the fruit after carpels have fallen; 5, flower dissected,—*all of natural size;* 6, anthers: *enlarged.*

8. T. PHELLOCARPA, *King, n. sp.* A tree 60 to 80 feet high; young branches minutely cinereous-pubescent. *Leaves* thinly coriaceous, oblong-lanceolate, acute; the base cuneate; upper surface glabrous, shining; the lower paler, dull, sparsely and minutely sub-adpressed-pubescent; main nerves 12 to 16 pairs, slightly prominent beneath when dry, ascending, interarching freely within the margin; reticulations minute, distinct on both surfaces; length of blade 4 to 6 in., breadth 1·3 to 2·15 in.; stipules narrowly oblong, about as long as the petioles, smooth; petiole ·5 to ·7 in., puberulous. *Flowers* solitary, axillary,

3 to 3·75 in. in diam. when fully expanded (buds not seen); pedicels stout, with several rings, about ·3 in. long, pubescent. Spathoid bract ovate-rotund, obtuse, glabrous. *Sepals* and *petals* 12, yellowish-white, glabrous, oblanceolate, sub-acute; the inner smaller. *Stamens* slightly more than half as long as the cylindric, glabrous gynœcium; styles rather thick, sub-recurved; anthers apiculate. *Fruit* sub-cylindric; its apex rather pointed; the base rounded, glabrous, sparsely lenticellate, 3 to 4 in. long and about 1·25 in. in diam.; individual carpels cuneate, about ·5 in. long.

Assam, Sibsagar district (Mr. S. Peal), where the vernacular name is *Korika sopa;* Mikir Hills,—Mr. G. Mann, who informs me that the native name there is *Tita sopa.*

The special names of the various kinds of *Soppa* seem to be rather loosely applied by the Assamese, and the term *soppa* is, moreover, not always confined to species of *Magnoliaceæ*. This species was first collected by Mr. S. Peal of Sibsagar, who kindly sent me flowering specimens and drawings. The flowers much resemble those of *Michelia oblonga*, Wall., to which I was disposed to refer it. The receipt, however, from Mr. G. Mann of good fruiting specimens made it impossible any longer to think of it as a *Michelia*. Mr. Mann's specimens were collected at some distance from Sibsagar. The species has, therefore, probably a wide distribution in the province.

Plate 47 *ter*. Talauma phellocarpa, *King*.—1, flowering branch; 2, section of flower; 3, petal from outer row; 4, ripe fruit; 5, axis and its processes after the carpels have fallen,—*all of natural size.*

I here subjoin a description of a new species from Sumatra.

Talauma Forbesii, *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 373. A small tree or shrub; glabrous except the peduncles which are adpressed-villose. *Leaves* oblong-lanceolate, acuminate both at base and apex, green and shining on both surfaces, thinly coriaceous; nerves 12 to 15 pairs; length of blade 4·5 to 6 in., breadth 1 to 1·5 in. *Flowers* terminal, solitary, erect, ·75 in. long, on stout peduncles. *Spathoid bract* of calyx densely covered with adpressed, fulvous, silky hair; buds pointed. *Sepals* and *petals* about equal in length, white, nearly glabrous. *Ripe fruit* 1·25 in. long; the individual carpels ·6 in. long, ovate, rugose, with short terminal beak. *Seeds* ·4 in. broad by ·3 in. long; the base compressed.—*Magnolia Forbesii, King MSS.*

Sumatra, on Kaiser's Peak, &c., at elevations of 5,000 to 6,500 feet. Forbes, Nos. 1853, 2066 and 2204.

This resembles *T. pumila*, Bl., but its leaves are not glaucous beneath, and they have more nerves; moreover the flowers are smaller and not drooping, the petals ovate and not obovate, and the carpels are only about half the length of those of that species.

Plate 45A. Talauma Forbesii, *King*.—1, twig with ripe fruit; 2, bud with spathoid bract; 3, flower; 4, young fruit; 5 seeds,—*all of natural size.*

4. Magnolia, *Linn.*

Trees or shrubs. *Leaves* evergreen or deciduous; buds enveloped in the convolute stipules, which are connate in pairs. *Flowers* large, usually terminal. *Sepals* 3. *Petals* 6

to 12, 2- to 4-seriate. *Stamens* numerous, many-seriate; filaments flat; anthers adnate, introrse. *Gynophore* sessile or shortly stalked. *Carpels* many, imbricated on a long axis, 2-ovuled, persistent; stigmas decurrent on the ventral suture. *Fruit* an elongated axis, with persistent, adnate, 1-2-seeded, dorsally dehiscing follicles. *Seeds* pendulous from the carpels by a long cord; outer walls of testa fleshy; albumen oily.

Distrib.—Temp. N. America, temp. and trop. E. Asia and Japan. Species about 18.

Synopsis of species.

Gynophore quite sessile.
- Ripe fruit oblong; carpels with long, coriaceous, apical beaks . . . . . 1. *M. pterocarpa.*
- Ripe fruit ovoid-cylindric . . . . . 2. *M. globosa.*
- Ripe fruit narrowly cylindric, elongate.
  - Sepals and petals 12 to 15 . . . . . 3. *M. Campbellii.*
  - Sepals and petals 9
    - Carpels villous . . . . . 4. *M. Malayi.*
    - „ smooth . . . . . 5. *M. Gustavi.*

Gynophore shortly stalked.
- Leaves 9 to 13 in. long, densely sericeous when young . 6. *M. Griffithii.*
- „ 6·5 to 8 in. long, puberulous when young . . . 7. *M. Pealiana.*

1. M. pterocarpa, *Roxb. Corom. Pl.* iii, 62, *t.* 266. A large tree; the young parts adpressed-tawny-pilose; the branchlets annulated, ultimately all parts glabrous. *Leaves* coriaceous, obovate-oblong, sub-rhomboidal, narrowed to the rather obtuse apex, and much narrowed to the acute base; both surfaces glabrous when adult: the upper shining, the lower rather dull and darker in colour; the reticulations conspicuous (when dry); nerves 12 to 17 pairs, prominent beneath; length 8 to 16 in., breadth 4·5 to 6 in.; petiole 1 to 1·75 in., thickened at the base; stipule narrowly convolute, about 3 in. long. *Flowers* solitary, terminal, 3·5 in. in diam. when expanded (rarely expanding); the bud ovoid-rotund and enveloped in a rotund, concave, coriaceous, cinereous-puberulous, caducous, spathoid bract. *Peduncle* stout, 1·5 to 2 in. long (longer in fruit), with many rings, tawny-pubescent or glabrescent. *Sepals* 3, coriaceous, broadly oval or obovate, concave, reflexed, green externally, white within, caducous. *Petals* 6, like the sepals in shape but broader, fleshy, white. *Ovaries* in a conical head, exceeding the stamens. *Ripe fruit* oblong-conic, 5 to 7 in. long and 1·5 to 2·5 in. in diam.; individual carpels narrowly ovoid, rugose, ·6 in. long, with long, spreading, lanceolate, coriaceous, apical beaks almost twice as long as themselves. *Seeds* 1 or 2, with orange-coloured testa.—*M. sphenocarpa, Wall. Cat.* 975 (*p.* 27); *Hook. fil. & Thoms. Fl. Ind.* 78; *Hook. fil. Fl. Br. Ind.* i, 41.—*Liriodendron grandiflorum, Roxb. Hort. Beng.* 43; *Fl. Ind.* ii, 654.—*Sphenocarpus, Wall. Cat.* 975 *corrig., p.* 236.—*Talauma Roxburghii, G. Don Gen. Syst.* i, 85.

Forests of tropical Himalaya from Nepal eastward; Assam Range, Khasia and Chittagong Hills; at low elevations. *Vern.* "*Boramthuri soppa.*"

Dried specimens of this both in leaf and flower much resemble the much commoner *Talauma Hodgsoni.*

Plate 53. Magnolia pterocarpa, *Roxb.*—1, branch with flower artificially expanded to show the parts; 2, bud with its spathoid involucre; 3, stamens and ovaries; 4, ripe fruit (of small size),—*all of natural size.*

2. M. GLOBOSA, *Hook. fil. & Thoms. Fl. Ind.* 77. A small tree; the young branches deciduously rufous-sericeous. *Leaves* membranous, ovate; the apex acute, or rounded and mucronate; the base rounded or minutely cordate; upper surface smooth, except the puberulous midrib; lower, especially when young, glaucous and sparsely covered with straggling rufous hairs; the midrib and 8 to 10 pairs of nerves rufous-sericeous; length 5 to 8 in., breadth 3 to 5 in.; petiole 1·5 to 1·75 in., rufous-tomentose, as is the narrow, 1·5 in. long, stipule. *Flowers* solitary, leaf-opposed, pedicellate, 4 or even 5 in. in diam.; the spathoid bract purple, fugaceous; pedicel 2·5 in. *Sepals* 3, obovate. *Petals* 6, like the sepals, but smaller. *Ripe fruit* ovoid-cylindric, 2·25 in. long; the individual carpels elongate, slightly rugose, with short, recurved, deciduous beaks.

In Sikkim; at elevations of from 9 to 10,000 feet. The flower represented in the accompanying plate is a small one. Many flowers are found at least 2 in. more in diameter. Their usual colour is white.

PLATE 50. Magnolia globosa, *Hook. fil. & Thoms.*—1, flowering branch; 2, ripe fruit: *of natural size.*

3. M. CAMPBELLII, *Hook. fil. & Thoms. Fl. Ind.* 77. A large tree; the young branches glabrous, annulate. *Leaves* deciduous, membranous, elliptic-oblong, sub-obovate to ovate, acute, slightly narrowed to the rounded or minutely cordate base; upper surface glabrous, the reticulations distinct (when dry); lower densely covered with pale tomentum when young, glabrous when adult, except the pubescent nerves and midrib; nerves 14 to 16 pairs; length 4 to 12 in., breadth 2 to 6 in.; petiole ·75 in. Stipules pilose. *Flowers* solitary, terminal, 6 to 10 in. in diam.; when in bud enveloped in 2 or more broadly ovate, externally pilose, spathoid involucres. *Sepals* and *petals* 12 to 15, similar, broadly ovate to obovate, the interior smaller. *Ripe fruit* cylindric, 6 to 8 in. long and about 1 in. in diam.; individual carpels ovoid, obtuse, compressed, 1-2-seeded.—*Hook. fil. Fl. Br. Ind.* i, 41; *Hook. fil. and Cathcart's Illust. Himal. Plants, t.* 4 *and* 5; *Gamble Ind. Timb.* 5. *Vern.* "*Lal Champ.*"

Bhotan and Sikkim Himalaya, at elevations of from 8,000 to 10,000 feet.

This is in every respect one of the most superb trees of the semi-temperate forest zone of the Eastern Himalaya. Specimens of it, 150 feet in height, used to be common at the time of Sir Joseph Hooker's visit to the province in 1849: most of these larger examples have long since been converted into timber; for the wood is of excellent quality, and is known as "*Lal Champ.*" The flowers are of the most lovely rose colour (occasionally they are white), and are sweetly scented. They appear while the plant is leafless, an arrangement which detracts much from their effectiveness.

PLATE 51. Magnolia Campbellii, *Hook. fil. & Thoms.*—1, flower-bud showing the spathoid involucre; 2, fully expanded flower: *of natural size;* 3, flower with calyx and corolla removed to show the stamens and spike of ovaries: *enlarged.* (*Copied from Hooker fil. & Cathcart's Illust. Himal. Plants, t.* 4 *and* 5.)

PLATE 52. *Fig.* 4, branch with young fruit; 5, ripe fruit; 6, spathoid bract; 7, seeds,—*all of natural size.*

4. M. MAINGAYI, *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 369. A tree; young branches and inflorescence densely clothed with pale shaggy hair. *Leaves* membranous, oblanceolate-oblong or obovate, acuminate, narrowed to the rounded base; upper surface glabrous, the lower glaucous; the midrib sparsely villous; nerves 16 to 20 pairs; length

of blade 6 to 8 in., breadth 2·5 to 3 in.; petiole ·3 in. *Flowers* terminal, solitary, shortly pedunculate; buds ovoid; the spathoid bract villous like the pedicel. *Sepals* 3, oblong. *Petals* about 6, of the same shape as the sepals, but smaller, yellowish-white, glabrous, 1 to 1·3 in. long. *Ovaries* villous. *Ripe fruit* cylindric, 1·5 in. long by ·6 in. diam.; the individual carpels ovoid, not beaked, ·35 in. long, villous.

Malacca (Maingay No. 17); Perak; Penang; in dense low forest up to 2,500 feet.

Plate 45B. Magnolia Maingayi, *King*.—6, branch with flower; 7, leaf stipules; 8, flower-bud; 9, anthers; 10, ripe fruit,—*all of natural size.*

5. M. Gustavi, *King, n. sp.* A tall tree; all parts quite glabrous; the branchlets slender, dark, not lenticellate. *Leaves* membranous, oblong-lanceolate or oblanceolate, acuminate; the base much narrowed, unequal; upper surface shining; the lower dull, sub-glaucous; the minute reticulations distinct on both; nerves 10 to 14 pairs; length 5 to 7 in., breadth 1·25 to 1·75 in.; petiole ·25 in. Stipules not seen. *Flowers* terminal and axillary, solitary, on slender peduncles 1·5 to 2 in. long, 3 to 4 in. in diam. when fully expanded; buds oblong-ovoid, 1·25 in. long; spathoid bract broadly ovoid, coriaceous, smooth. *Sepals* and *petals* 9, nearly equal in size, oblanceolate, blunt: the petals coriaceous, the sepals membranous. *Stamens* little more than ·5 in. long, much shorter than the densely imbricate gynœcium. *Ovaries* sessile, smooth; the styles recurved. *Fruit* (even when half-ripe) clavate (from the abortion of the lower ovaries); when ripe, 2·5 to 3·5 in. long and 1·5 in. in diam.; individual carpels very little compressed, sub-orbicular, not beaked, sessile, glabrous, about ·75 in. long.—*Michelia Gustavi, King MSS.*

Makum Forest, Upper Assam, at elevations of 1,000 to 2,000 feet,—*G. Mann.*

A species hitherto found only by Mr. Gustav Mann in the botanically little-known Makum Forest in Assam, and named in his honour. It approaches *Michelia Cathcartii*, Hook. fil. & Thoms., very closely in many respects, and notably in its leaves, which are, however, longer and have minuter reticulations than those of *M. Cathcartii*, and at all ages are glabrous. There is also great similarity in the flowers of the two plants; but the sepals and petals of *Magnolia Gustavi* are narrower, and the stamens are much shorter than the same organs in *Michelia Gustavi*. This moreover has no gynophore. *Magnolia Gustavi* is found at quite low elevations (1,000 to 2,000 feet); whereas *Michelia Cathcartii* never occurs lower than 5,000 and it ascends to 7,000 feet.

Plate 61. Magnolia Gustavi, *King*.—1, branch with fully expanded flower; 2 and 3, buds enclosed in their spathoid bracts; 4, half-opened bud; 5, gynœcium; 7, twig with very young fruit; 8, fruit at an older stage; 9, ripe fruit: *of natural size;* 6, stamens: *slightly enlarged.*

6. M. Griffithii, *Hook. fil. & Thoms. Fl. Br. Ind.* i, 41. A large tree; the young branches densely covered with deciduous, yellowish, silky hair. *Leaves* sub-coriaceous, elliptic-oblong or elliptic, very shortly acuminate, minutely undulate; the base sub-acute; upper surface smooth, except the sometimes pubescent midrib; the reticulations minute, distinct (when dry); lower surface at first sericeous-tomentose, finally pubescent or glabrous; nerves 16 to 20 pairs, rather prominent beneath; length 9 to 13 in., breadth 4 to 5 in.; petiole ·75 in., stout; stipules narrow, 4 in. long, externally sericeous. *Flowers* solitary, leaf-opposed, 3·5 in. in diam. when fully expanded. The buds enveloped in a spathoid bract, which, like the pedicel, is covered with whitish, silky, adpressed hair; pedicel 1·5 to 2 in. long. *Sepals* 3, narrowly oblong, obtuse; *petals* 6, like the sepals

but smaller; *gynæcium* much longer than the stamens, vermicular. *Ripe fruit* 3·5 to 6 in. long; individual carpels without beaks, ·5 in. long and nearly as broad, rugose externally, 1- rarely 2-seeded.

Assam, near Sadya,—*Griffith;* Sibsagar,—*S. E. Peal;* Makum Forest, Rengma-Naga and Mikir Hills,—*G. Mann;* Sylhet,—*Wallich;* Cachar,—*G. Mann.* *Vern.* "*Bor Gahori Soppa.*"

Sir Joseph Hooker described this species from the imperfect material in the Griffithian collection, and he expressed a doubt whether it might not be a *Manglietia.* Through the kindness of Mr. S. E. Peal, a resident in the Sibsagar district of Assam, I have been furnished not only with excellent specimens, but with notes and drawings made by himself from fresh flowers. I have also received very full materials from Mr. G. Mann. I am thus able to state that the ovaries have only two ovules, and that the plant is therefore not a *Manglietia* (which has six ovules). There is a very distinct stalk to the gynophore, at least after the ovaries have been impregnated. The presence of a stalk to the gynophore therefore loses its value as a diagnostic mark of the genus *Michelia.* This appears to me to be in the order *Magnoliaceæ*, rather an insufficient generic distinction; and in my humble opinion the two genera, although both are Linnæan, should be merged in one, and *Michelia*, being the later of the two, should be reduced. Two sets of specimens, collected respectively by Mr. Mann in the Katakul Forest, Cachar, and in the Makum Forest, Upper Assam, which apparently belong to this species, have leaves quite glabrous.

Plate 48. Magnolia Griffithii, *Hook. fil. & Thoms.*—1, young leaf with stipule; 2, flower-bud enveloped in its spathoid involucre; 3, fully expanded flower; 4, stamens and carpophore; 5, carpophore further advanced and showing a stalk; 6, ripe fruit: *of natural size.*

Plate 49. Adult leaves, and fruit after dehiscence of its carpels: *of natural size.*

7. M. Pealiana, *King, n. sp.* A tall tree; young branches rather slender, at first densely covered with adpressed, pale yellow, silky hair, but speedily glabrous. *Leaves* thinly coriaceous, oblong-elliptic, sometimes slightly obovate, shortly and abruptly acuminate; both surfaces minutely but distinctly reticulate: the upper shining, glabrous; the lower at first puberulous, but quickly becoming glabrous; main nerves 15 to 18 pairs, prominent beneath, ascending, curving, interarching freely towards the apices; length 6·5 to 8 in., breadth 2·5 to 3 in.; petiole ·2 to ·25 in.; stipules very narrow, 1·25 in. long, sericeous outside. *Flowers* solitary, leaf-opposed, on long peduncles, 3 to 4 in. in diam. when fully expanded; the buds covered by a pointed spathoid involucre which, like the pedicel and stipules, is covered with pale yellow, adpressed, silky hair; pedicel 1·5 in. long, half an inch longer in fruit. *Sepals* 3, coriaceous, linear-oblong, sub-acute; the edges slightly undulate near the apex. *Petals* 6, of the same shape and texture as, but smaller than, the sepals; gynœcium more than twice as long as the stamens, cylindric. *Ripe fruit* 3 to 5 in. long and about ·75 in. in diam.; individual carpels ·6 in. long by about ·45 in. broad, outside slightly lenticellate, inside smooth and shining; seeds 2.—*Michelia Pealiana, King MSS.*

Assam, Makum Forest,—*G. Mann.* *Vern.* *Gahori Soppa.*

This species has been named in honour of Mr. S. Peal, of Sibsagar, who has given much friendly help in working out the Magnoliads of Assam. It is closely allied to *M. Griffithii*, Hook. fil. & Thoms., and, as in that species, there is a distinct,

though short, stalk to the gynophore. It is best distinguished from *M. Griffithii* by the smaller size of its leaves, which, moreover, are at most puberulous even when young, whereas those of *M. Griffithii* are densely sericeous when young.

PLATE 59. Magnolia Pealiana, *King*.—1, branch with flower; 2, bud; 3, flower dissected to show all the parts; 4, gynœcium; 6, ripe fruit; 7, seeds: *of natural size*; 5, stamens: *enlarged*.

5. Manglietia, *Blume*.

Trees; foliage and inflorescence of *Magnolia*. *Sepals* 3. *Petals* 6 or more, 2- or more seriate. *Stamens* very numerous, many-seriate; anthers linear, adnate, introrse. Gynophore sessile. *Ovaries* many, cohering in an ovoid head; stigma decurrent on the ventral suture; ovules 6 or more. *Fruit* ovoid; carpels persistent, dehiscing dorsally. *Seeds* as in *Magnolia*. DISTRIB.—Mountains of tropical Asia. Species 5.

Synopsis of species.

Shrubby.
- Young branches and petioles villous; spathoid hood of calyx fulvous-sericeous . . . . . 1. *M. Sebassa*.

Arboreous.
- Flowers 3 to 5 in. in diam.
  - Leaves oblanceolate to lanceolate-oblong, 4·5 to 7 in. long; flowers 4 to 5 in. in diam.; carpels 3- to 4-seeded . . . 2. *M. insignis*.
  - Leaves elliptic or elliptic-oblong, 8 to 10 in. long; flowers 4 in. in diam.; carpels 1-seeded . . . . . 3. *M. Caveana*.
  - Leaves oval or obovate-oblong, 5 to 7 in. long; flowers 3 in. in diam.; carpels 2-seeded . . . . . 4. *M. glauca*.
- Flowers less than 1 in. in diam.
  - Leaves lanceolate, rufous-pubescent beneath . . . . . 5. *M. Kunstleri*.

1. M. SEBASSA, *Miq. Ann. Mus. Lugd. Bat.* iv, 71. A shrub; adult branches with pale shining bark; young tawny-villous, as are the petioles. *Leaves* coriaceous, oblong or oblanceolate, acute, much narrowed at the base, glabrous and shining on both surfaces, bullate; nerves 14 to 20 pairs, prominent; length of blade 11 to 14 in., breadth 4·5 to 7 in.; petiole 1 in., much thickened at base. *Flowers* solitary, terminal, on villous peduncles 2 to 3 in. long. Spathoid bract densely adpressed-fulvous-sericeous. *Sepals* and *petals* about 9, fleshy, pale yellow, from obovate to oblong, abruptly contracted into a claw at the base, nearly 2 in. long. *Stamens* with very stout filaments. *Pistils* about 20. *Ripe carpels* (*fide* Miquel) oblong, lenticellate.—*Miq. Fl. Ind. Bat. Suppl.* 367; *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 370.

Perak,—*Kunstler;* in dense jungle, at elevations of about 1,500 feet: only once collected.

DISTRIB.—Sumatra.

The specimens collected by the late Mr. Kunstler are without fruit. They agree in other respects with the Sumatran specimens on which Miquel founded the species.

PLATE 54. Manglietia Sebassa, *Miq.*—Flowering branch: *of natural size*.

2. M. INSIGNIS, *Bl. Fl. Jav. Magnol.* 23. A large tree; leaf-buds, young branches, petioles, and pedicels fulvous-pubescent; all other parts glabrous; branches annulate. *Leaves* thinly coriaceous, oblanceolate to lanceolate-oblong or elliptic, acute or shortly

acuminate, narrowed gradually from the middle to the base; reticulations minute, distinct; upper surface shining, lower pale dull, sub-glaucescent; nerves 12 to 16 pairs, not much more prominent than the secondary nerves; length 4·5 to 7 in. (9 in. in var. *angustifolia*), breadth 2 to 3 in.; petiole ·75 to 1·25 in. Stipules 1·2 in., cinnamoneous-pilose. *Flowers* solitary, axillary or terminal; when fully open 4 to 5 in. in diam.; buds ovoid-cylindric, 2 in. long; spathoid bract smooth, glaucous. *Sepals* 3, oblanceolate or oblong, obtuse, reflexed. *Petals* 9: the outer larger than, but like, the sepals in form, the inner smaller; column of ovaries exceeding the stamens. *Ripe fruit* ovoid-oblong, obtuse, 3 to 5 in. long; individual carpels compressed, ovate-oblong, with short blunt beaks, ·5 to ·75 in. long, dehiscing dorsally; seeds 3 or 4.—*Hook. fil. & Thoms. Fl. Ind.* 76; *Hook. fil. Fl. Br. Ind.* i, 42.—*Magnolia insignis*, *Wall. Tent. Fl. Nep.* 3, *t.* 1; *Pl. As. Rar.* 78, *t.* 182; *Cat.* 973 (*in part*).

Nepal; Sikkim; Assam and Khasia ranges from 3,000 to 6,000 feet. Rengma-Naga Hills,—*G. Mann. Vern.* "*Phul Soppa.*"

In Sikkim this species is rare; it has, so far as I know, been found there only on the Singa-le-la spur.

A very tall, handsome tree; the petals whitish-yellow, tinged with pink, or pure white; the calyx dull red with greenish veins. The ripe fruit is erect, of a purple colour, the suspended seeds being scarlet. There is considerable variability in the shape of the leaves. Wallich, who had living trees under observation during his residence in Nepal, says that on the older branches of the same tree the leaves tend to the elliptic form; on luxuriant branches they are more elongate and oblanceolate. The vernacular name in the Naga Hills is (I am informed by Mr. S. E. Peal, of Sibsagar) *Phul Sopa*, and trees there often attain a girth of 12 or 14 feet.

Var. *angustifolia:* leaves 8 to 9 in. long by 1 to 2 in. broad.

Khasia and Assam.

Only leaf specimens of this variety are known as yet. It may probably prove to be a distinct species.

Plate 55. Manglietia insignis, *Bl.*—1, branch with newly-opened flower; 2, flower showing the reflexed sepals; 3, flower-bud; 4, section of flower; 5, ripe fruit,—*all of natural size.* (*Partly copied from Wallich's Tentamen Floræ Nepalensis.*) Unfortunately the branch selected for figuring has not very characteristic leaves. They are a good deal broader than is usual.

3. M. Caveana, *Hook. fil. & Thoms. Fl. Ind.* 76. A large tree, glabrous in all its parts; young branches dark-coloured, annulate. *Leaves* thinly coriaceous, elliptic or elliptic-oblong, slightly obovate; the apex shortly and abruptly acuminate, slightly narrowed at the base; both surfaces minutely and distinctly reticulate: the upper shining, the lower rather dull and slightly paler; main nerves 13 to 15 pairs, spreading, thin, but distinct when dry; length 8 to 10 in., breadth 3·2 to 3·6 in.; petiole 1·25 in., slender. *Flowers* solitary, axillary, when fully open 4 in. in diam.; buds narrowly obovoid or cylindric, 2 in. long; spathoid bract smooth, sub-glaucous. *Sepals* 3, oblanceolate, obtuse; the edges undulate. *Petals* 7 to 9, the outer larger than the inner, but all smaller than the sepals and of the same shape; column of ovaries much longer than the stamens. *Ripe fruit* ovoid, blunt, 2·25 to 3 in. long; individual carpels much compressed, shortly and bluntly beaked, profusely lenticellate on the back, smooth inside, 1-seeded, ·75 in. long.—*Hook. fil. Fl. Br. Ind.* i, 42.

Khasia Hills: at elevations of from 2,000 to 3,000 feet,—*Hook. fil. & Thoms.*; at 3,500 feet,—*G. Mann;* Assam, in the Makum Forest, Lukimpore District,—*G. Mann.*

Mr. Mann describes this as a tree attaining, in the Khasia Hills, a girth of 10 feet. It is closely allied to *M. insignis*, Bl., but differs from that species by its larger leaves and 1-seeded carpels. In my own opinion it would be better treated as a variety of *insignis*. The vernacular name is the same as for the last, viz. "*Phul Soppa.*"

PLATE 57. Manglietia Caveana, *Hook. fil. & Thoms.*—Branch with nearly ripe fruit: *of natural size.* 1, section of a ripe carpel: *slightly enlarged;* 2, seed: *considerably enlarged.*

PLATE 57 *bis.* Manglietia Caveana, *Hook. fil. & Thoms.*—Branch with bud. 1, flower artificially opened, and 2, ripe fruit,—*all of natural size.* [NOTE.—*The stamens have been removed from the flower in order to show the whole of the gynœcium.*]

4. M. GLAUCA, *Bl. Bat. Verh.* ix, 149. A tall glabrous tree. *Leaves* coriaceous, oval or obovate-oblong, slightly acuminate; the edges slightly recurved when dry, glaucescent beneath; nerves 12 to 14 pairs, not prominent; length of blade 5 to 7 in., breadth 2·5 to 3 in.; petiole ·75 to 1·5 in. *Flowers* about 3 in. in diam., terminal, solitary, on annulate peduncles 1 to 1·5 in. long, yellowish. Spathoid bract broadly ovate, glabrous. *Sepals* and *petals* 9, greenish-yellow, oblong, sub-acute, those internal smaller. *Filaments* short. *Pistils* numerous. *Ripe fruit* ovoid, the size of a hen's egg, glabrous; carpels 2-seeded. *Seed* with a red fleshy arillus.—*Bijdr.* 8; *Fl. Jav. Magnol.* 22, *t.* 6; *Miq. Fl. Ind. Bat.* i, *pt.* 2, *p.* 15; *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 370.

Perak at 3,000 feet.

DISTRIB.—Java.

PLATE 56. Manglietia glauca, *Bl.*—Branch with bud, flower and young fruit. 1, young flower-bud; 2, stamens and ovaries; 4, ovaries after fertilization; 6, young fruit: *of natural size;* 3, stamen, inner face; 5, vertical section of carpophore; 7, single carpel: *enlarged.* (*Partly copied from Blume's Flora Javæ.*)

5. M. SCORTECHINII, *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 370. A tree; the young branches, stipules and under surfaces of the leaves minutely rufous-pubescent. *Leaves* thinly coriaceous, lanceolate, narrowed to base and apex, the latter sub-acute; upper surface shining; reticulations minute, distinct on both surfaces; nerves about 12 pairs; length of blade 3·5 to 4 in., breadth 1·25 in; petiole ·3 to ·4 in. *Flowers* rather less than 1 in. in diam., solitary, axillary, on annulated pedicels shorter than the petioles; stipular hood rufous, silky. *Sepals* and *petals* about 12, similar, ·5 in. long, linear-lanceolate. *Stamens* linear. *Fruit* ovoid (young ·5 in. long), on a short gynophore, rufous-pubescent. *Carpels* 6 to 8.—*Magnolia Scortechinii, King MSS.*

Perak,—*Father Scortechini.*

The only specimens of this have unripe fruit. The ovaries have only 1 ovule; but apparently it is a *Manglietia*, and I therefore put it into this genus provisionally. The small rufous leaves, shining on the upper surfaces, and small axillary flowers, mark it as distinct from any other Indo-Malayan *Magnoliad.*

PLATE 58A. Manglietia Scortechinii, *King.*—1, 2, flowering branches; 3, unripe fruit: *of natural size.*

6. Michelia, *Linn.*

Trees. *Leaves* as in *Magnolia*. *Flowers* axillary, solitary or terminal. *Sepals* and *petals* similar, 9 to 15 or more, 3- or more-seriate. *Stamens* as in *Magnolia*. Gynophore stalked. *Carpels* in a loose spike; stigma decurrent; ovules 2 or more. *Fruit* a more or less lax elongate spike of coriaceous dorsally dehiscing carpels. *Seeds* of *Magnolia*.

Distrib.—About 16 species; temp. and trop. mountains of India.

Synopsis of the species.

Carpels numerous.
- Flowers mostly terminal . . . . . 1. *M. Cathcartii.*
- Flowers axillary.
  - Young parts, spathoid bracts, and stipules pubescent.
    - Leaves underneath densely covered with grey tomentum, even when adult . . . . . 2. *M. lanuginosa.*
    - Leaves and young parts densely rufous-tomentose, ultimately glabrous; flower 4 to 5 in. in diam., white . . . . 3. *M. excelsa.*
    - Leaves often with grey pubescence beneath.
      - Leaves more than 4 in. long; flower yellow . . . . . 4. *M. Champaca.*
      - „ 2 to 4 in. long; flower white . . . . . 5. *M. nilagirica.*
    - Leaves glabrous.
      - Flowers 1 to 1·5 in. in diam., pale yellow; leaves with rounded bases . . . . . 6. *M. kisopa.*
      - Flowers 1·25 to 1·5 in. in diam., white; petals obovate-cuneate; leaves acute at the base . . . . . 7. *M. punduana.*
  - All parts quite glabrous.
    - Flowers 3 to 4 in. in diam.; petals linear-lanceolate or oblanceolate; leaves thinly coriaceous, obovate-oblong . 8. *M. oblonga.*
    - Flowers about 3 in. in diam.; sepals small, linear; petals oblanceolate; leaves coriaceous, obovate-elliptic, blunt . 9. *M. Mannii.*
- Carpels only 2 or 3, often solitary, very large . . . . . 10. *M. montana.*

1. M. Cathcartii, *Hook. fil. & Thoms. Fl. Ind.* 79. A tall tree; the young branches, peduncles, and midribs of leaves on both surfaces finely sericeous, but ultimately glabrous; other parts glabrous. *Leaves* thinly coriaceous, shining, oblong-lanceolate, acuminate; the base slightly narrowed or rounded; reticulations distinct on both surfaces, rather fine; nerves 10 to 13 pairs, thin, forming wide intra-marginal arches; length 3 to·5 in., breadth 1·25 to 1·75 in.; petiole ·25 in.; stipules narrow, sericeous, ·6 to ·75 in. long. *Flowers* usually terminal, solitary, pedicellate, when fully open 3 to 4 in. in diam., white; buds oblong, blunt; peduncle 1 in. long. *Sepals* and *petals* 9, oblong, obtuse, the inner narrower. *Stamens* more than 1 in. long. *Column of ovaries* densely imbricate, narrow, shorter than the stamens. *Fruit* cylindric, 3 to 4 in. long and ·75 in. in diam. when ripe; individual carpels sessile, compressed, sub-orbicular, beaked when young, but not when ripe; the walls thin, woody, lenticellate externally, ·35 in. across; *seeds* 2 or 3.—*Hook. fil. Ill. Him. Pl., t.* 7; *Fl. Br. Ind.* i, 42; *Gamble Ind. Timb.* 6.

Sikkim Himalaya, alt. 5,000 to 7,000 feet, common. Assam, Naga Hills,—*Watt, Prain.*

PLATE 60. Michelia Cathcartii, *Hook. fil. & Thoms.*—1, branch with flower-bud; 2, fully expanded flower; 3, 4 and 5, carpels in various stages: *of natural size;* 6, anthophore with the stamens removed and carpophore; 7, stamens: *enlarged.* (*Partly copied from Hook. fil. & Cathc. Ill. Him. Plants.*)

2. M. LANUGINOSA, *Wall. Tent. Fl. Nep.* 8, *t.* 5; *Cat.* 6493. A tall tree; the young parts, petioles, the under surfaces of the adult leaves, stipules, and spathoid bracts densely covered with pale grey tomentum. *Leaves* sub-coriaceous, oblong or lanceolate, acute; the base acute or rounded; upper surface glabrous; the reticulations minute but distinct; nerves 14 to 17 pairs, prominent beneath; length 6·5 to 9 in., breadth 2·25 to 3 in.; petiole ·75 in.; stipules narrowly oblong, 1 to 2 in. long. *Flowers* solitary, axillary, shortly pedunculate, when expanded 2·5 to 3 in. in diam.; buds oblong, 1·25 in. long; spathoid bracts 2, oblong, densely sericeous-tomentose externally; peduncle ·2 in. thick. *Sepals* and *petals* varying from 12 to 18, oblanceolate; the inner smaller, yellowish-white. *Stamens* shorter than gynœcium, very caducous. *Ovaries* densely lanate; the styles glabrous. *Fruit* 4 to 5 in. long; individual carpels distant, shortly stalked, obovoid-compressed, woody, lenticellate, not beaked, ·6 to 1 in. long; *seeds* 1 or 2, large.—*Wight Ill.* i, 14; *Hook. fil. & Thoms. Fl. Ind.* 80; *Hook. fil. Fl. Br. Ind.* i, 43; *Gamble Ind. Timb.* 7.—*M. velutina, DC. Prod.* i, 79.

Temperate Himalaya, Nepal to Bhotan, alt. 5,000 to 7,000 feet; Khasia Hills.

This species has a grey soft wood not so useful for building as that of some of the other species. Its Nepalese name is *Gogay Champ.*

PLATE 62. Michelia lanuginosa, *Wall.*—1, flowering branch; 2, young leaf and stipule; 3, ripe fruit,—*all of natural size.*

3. M. EXCELSA, *Bl. Fl. Jav. Magnol.* 9. A large tree; the young parts densely covered with brown ferrugineous tomentum; the branchlets stout, dark, lenticellate. *Leaves* thinly coriaceous, ovate-elliptic to oblong or oblong-lanceolate, acute; the base slightly narrowed or rounded; upper surface when adult shining, glabrous; the lower glaucous, silky brown when young, glabrescent and dull when old; nerves 7 to 8 pairs, thin but prominent on the lower surface; the reticulations distinct on both; length 5 to 8 in., breadth 2 to 3·5 in.; petiole ·75 to 1 in. *Stipules* oblong, acuminate, sericeous externally, 1·5 to 2 in. long. *Flowers* white, sub-sessile, axillary, solitary, when fully open 4 to 5 in. in diam.; buds ovoid-cylindric, 2 in. long; spathoid bracts oblong, brown, densely silky-tomentose outside. *Sepals* and *petals* 12, white, obovate-spathulate, the inner smaller. Stamens much shorter than the gynœcium. *Fruit* 4·5 to 8 in. long; individual carpels rather distant, obliquely ovoid, shortly beaked, ·4 to ·6 in. long, thinly woody, 1- to 2-seeded.—*Wight Ill.* i, 14; *Hook. fil. & Thoms. Fl. Ind.* 80; *Hook. fil. Fl. Br. Ind.* i, 43; *Gamble Ind. Timb.* 6; *Griff. Ic.* iv, 655.—*Magnolia excelsa, Wall. Tent. Fl. Nep.* 5, *t.* 2; *Cat.* 6494.

Temperate Himalaya from Nepal to Bhotan, alt. 5,000 to 8,000 feet; Khasia Hills.

The wood of this, although soft, is very durable, and is largely used for building. It is known to the Nepalese as *Bara or safed Champ.*

PLATE 63. Michelia excelsa, *Bl.*—1, branch with flower-buds enclosed in their spathoid bracts; 2, expanded flower; 3, stamen; 4, gynœcium; 5, ripe fruit (*of small size*); 6, carpel; 7, seeds,—*all of natural size.*

4. M. CHAMPACA, *Linn.* A tall tree; the branchlets pubescent. *Leaves* membranous, ovate-lanceolate, acuminate, rather abruptly narrowed to the base, shining above, pale and glabrous or puberulous beneath; main nerves thin, 12 to 16 pairs; length of blade 4·5 to 9 in., breadth 2·25 to 3·5 in.; petiole 1 to 1·5 in. *Flowers* yellow, solitary, axillary or terminal, shortly pedunculate; buds narrowly ovoid; the spathoid bract silky. *Sepals* oblong. *Petals* about 15, narrowly oblong, 1 in. long. *Ripe fruit* 3 to 6 in. long; individual carpels ovoid, lenticellate, woody.—*DC. Prodr.* i, 79; *Roxb. Fl. Ind.* ii, 656; *W. & A. Prod.* i, 6; *Wight Ill.* i, 13; *Wall. Cat.* 969 *except K; Blume Fl. Jav. Magnol., t.* i; *Bijdr.* 7; *Hook. fil. & Thoms. Fl. Ind.* 79; *Hook. fil. Fl. Br. Ind.* i, 42; *Miq. Fl. Ind. Bat.* i, *pt.* ii, 16; *Gamble Ind. Timb.* 6; *Brandis For. Flora* 3, *t.* 1; *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 371.—*M. rufinervis, DC. l. c.* 79; *Bl. Bijdr.* 8.—*M. Doldsopa, Ham. ex DC. l. c.; Don Prodr.* 226; *Wall. Tent. Fl. Nep., t.* 3; *Wight Ill.* 13; *Wall. Cat.* 971.—*M. aurantiaca, Wall. Cat.* 6492; *Plant. As. Rar., t.* 147; *Wight Ill.* 13.—*M. Rheedii, Wight Ill.* 14, *t.* 5, *f.* 6.—*M. pubinervia, Bl. Fl. Jav. Magnol., p.* 14, *t.* 4.

India; sub-temperate forests in the Straits Settlements, but not common.

A tree much esteemed on account of the sweetness of its flowers, and often planted near Jain and Hindu temples. This is the "*Champ*" *par excellence:* its wood is very durable, and is useful for cabinet work as well as for building.

PLATE 64. Michelia Champaca, *Linn.*—1, flowering branch; 2, flower fully expanded; 3, spathoid bract; 4, gynœcium; 5, stamen; 6, ripe fruit: *of natural size;* 7, stamen; 8, ovary: *enlarged.*

5. M. NILAGIRICA, *Zenk. Pl. Ind., t.* 30. A tree or large shrub; young branches, stipules, peduncles and spathoid bracts pale-sericeous. *Leaves* elliptic, obovate-elliptic or oblanceolate, acute or very shortly acuminate, narrowed to the petiole, puberulous on the midrib, otherwise glabrous; upper surface shining, lower dull; reticulations open, distinct; main nerves 7 to 9 pairs, thin; length 2 to 4 in., breadth 1 to 2 in.; petiole ·5 to ·75 in.; stipules equal to the petioles, sericeous, narrowly oblong. *Flowers* axillary, solitary, shortly pedunculate, 3 to 4 in. in diam., white; buds ovoid, pointed, ·5 in. to 1 in.; spathoid bracts ovate-rotund, pale-sericeous; peduncles thick, ·25 in. long. *Sepals* and *petals* 9 to 12, white, oblanceolate, the inner smaller and more acute. *Stamens* shorter than the gynœcium; ovaries silky; styles glabrous. *Ripe fruit* 2 to 3 in. long; individual carpels not crowded, sessile, finely rugose, lenticellate, woody, ovoid, sub-compressed, shortly beaked, ·5 in. long; ovules 2 to 5.—*Wight Ill.* i, 14; *Ic., t.* 938; *Hook. fil. & Thoms. Fl. Ind.* 82; *Hook. fil. Fl. Br. Ind.* i, 4; *Bedd. Fl. Sylv., t.* 62; *Thwaites Enum.* 5.—*M. Pulneyenis, Wight Ill.* i, 14, *t.* 5 (*except figs.* 5 *and* 6).—*M. ovalifolia, Wight Ill.* i, 13.

Higher mountains of Southern India; alt. 5,000 to 6,000 feet.

VAR. WALKERI: leaves 2—3 by 1—1½ in., oblong or obovate-oblong, glaucous below; segments of perianth usually 9; ovules 2, superposed.—*M. Walkeri* and *M. glauca, Wight Ill.* i, 13, 14.

PLATE 65. Michelia nilagirica, *Zenk.*—1, flowering branch; 2 and 3, stamens and gynœcium; 4, stamens; 5, ovary; 6 and 7, fruit; 8, leaf and gynœcium of VAR. Walkeri,—*all of natural size.*

6. M. KISOPA, *DC. Prodr.* i, 79. A tall tree; the young branches thin; their bark dark, sparsely lenticellate, greyish-pubescent at first, but soon glabrous, as are all other parts, except the spathoid bracts. *Leaves* coriaceous, elliptic, oblong or oblong-lanceolate, acute or shortly acuminate; the base narrowed or rounded; both surfaces quite glabrous when adult: the upper shining, the lower dull, sub-glaucous, puberulous when young; reticulations distinct; nerves 10 to 12 pairs, faint; length 5 to 6·5 in., breadth 1·5 to 2·25 in.; petiole about 1 in., slender; stipules narrowly oblong, grey-pubescent externally, ·6 in. long. *Flowers* solitary, axillary, sub-sessile, pale yellow, when expanded 1 to 1·5 in. in diam.; buds ovoid, ·5 in. long; spathoid bracts 2, fleshy, ovate-rotund, grey-pubescent externally; peduncles ·15 in., stout. *Sepals* and *petals* from 12 to 15, narrowly obovate, acute; the inner smaller, pale yellow. *Stamens* not so long as the gynœcium. *Ovaries* sericeous-villose; styles recurved. *Fruit* 3 to 4 in. long; individual carpels sessile, rounded, compressed, lenticellate, ·4 in. in diam.; *seeds* 3 or 4.—*Wall. Tent. Fl. Nep.* 8, *t.* 4; *Cat.* 670; *Don Prod. Nep.* 226; *Wight Ill.* i, 13; *Hook. fil. & Thoms. Fl. Ind.* 81; *Hook. fil. Fl. Br. Ind.* i, 43.

Temperate Himalaya from Kumaon to Nepal; alt. 5,000 to 7,000 feet, common; Sikkim, rare.

PLATE 58B. Michelia kisopa, *Ham.*—4, flowering branch; 5, buds; 6, gynœcium and one stamen; 7, ripe fruit: *of natural size;* 8, stamens: *enlarged.*

7. M. PUNDUANA, *Hook. fil. & Thoms. Fl. Ind.* 81. A tall tree; the youngest branches, stipules, spathoid bracts and peduncles rufous-pubescent; all other parts glabrous. *Leaves* thinly coriaceous, glabrous, oblong, oblong-elliptic, rarely elliptic, shortly and abruptly acuminate; the base acute; the reticulations wide, distinct on both surfaces; the upper shining, the lower dull; nerves 9 to 11 pairs, not prominent; length 3 to 5 in., breadth 1·75 to 2 in.; petiole ·5 to ·75 in.; stipules narrowly oblong, about as long as the petiole. *Flowers* axillary, solitary or in pairs, sub-sessile, when fully expanded 1·25 to 1·5 in. in diam.; buds ovoid, apiculate, ·6 in. long; spathoid bracts ovate-rotund; peduncle ·2 in. *Sepals* and *petals* about 9, in three rows: the outer 6 obovate-cuneate; the inner 3 or 4 much smaller, oblanceolate, acute. *Stamens* nearly as long as the gynœcium. *Ripe fruit* 3 to 4 in. long; the individual carpels distant, sub-globular, compressed, not beaked, lenticellate, woody, ·4 in. in diam.—*Hook. fil. Fl. Br. Ind.* i, 43.—*Magnolia punduana, Wall. Cat.* 974; *Cat.* 6494 *in part?*

Khasia Hills, alt. 3,000 to 5,000 feet.

This resembles *M. oblonga*, Wall., so much that Wallich himself confused them; his specimens from Cherra Punji (Cat. 972A), although issued as *oblonga*, being in fact this species. The best characters to separate the two are found in the expanded flower, which in this is only about 1·25 in. in diameter, and has its outer segments obovate, cuneate; while the flower of *oblonga* measures 3 to 4 in. and has all its segments narrow.

PLATE 66. Michelia punduana, *Hook. fil. & Thoms.*—1, flowering branch; 2, ripe fruit: *of natural size.*

8. M. OBLONGA, *Wall. Cat.* 972 (*in part*). A tall tree; all parts quite glabrous. Leaves thinly coriaceous, obovate-oblong, shortly and abruptly acuminate, gradually tapering from above the middle to the slender petiole; upper surface shining, the lower dull, rather pale; the reticulations lax, distinct on both surfaces; the nerves 7 to 9 pairs, rather prominent on the lower; length 3·5 to 5·5 in., breadth 1·5 to 2·5 in.;

petiole ·75 in.; stipules narrowly oblong, about as long as the petiole. *Flowers* axillary, solitary, shortly pedunculate, 3 to 4 in. in diam. when expanded; buds elongate-ovoid, pointed; spathoid bracts leathery, smooth; peduncle ·3 in., stout, annulated. *Sepals* and *petals* 12, linear-lanceolate or oblanceolate, nearly equal. *Stamens* shorter than gynœcium. *Ripe fruit* 6 to 7 in. long; the individual carpels lax, sessile, obovoid, lenticellate, woody, not beaked.—*Hook. fil. & Thoms. Fl. Ind.* 81; *Hook. fil. Fl. Br. Ind.* i, 43; *Gamble Ind. Timb.* 7.

At the base of the Khasia Hills,—*Wallich;* Sibsagar district, Assam,—*Mr. S. E. Peal;* Sylhet,—*Mann.*

This is one of the largest trees of this family in India. It is known to the Assamese as the *Bor* (large) *Soppa.* Until quite recently good specimens of this species were in no herbarium, and the description given by Sir J. D. Hooker in the Flora of British India was drawn up on imperfect material. Through the kindness of Mr. S. E. Peal, of Sibsagar, a splended suite of specimens in all stages of flower and fruit has been sent to the Calcutta Herbarium; and from these, as well as from Mr. Peal's drawings of the fresh flowers and fruit, the accompanying figure has been prepared. The flowers of this much resemble those of *Talauma phellocarpa*, King, the petals in both being yellowish-white. The bark (Mr. Peal informs me) is whitish-grey in colour.

PLATE 67. Michelia oblonga.—1, flowering branch; 2, fully expanded flower; 3, section of flower; 4, petal; 5, spathoid bract; 6, ripe fruit,—*all of natural size.*

9. M. MANNII, *King, n. sp.* A glabrous tree; the young branches with dark, smooth, sparsely lenticellate bark. *Leaves* coriaceous, obovate-elliptic, blunt, or with an abrupt short blunt point, gradually narrowed in the lower third to the stout petiole; shining on the upper, rather dull on the lower surface; main nerves 8 to 10 pairs, rather prominent; reticulations wide, very distinct; length 5 to 7 in., breadth 3·5 to 4·5 in.; petiole 1 in.; stipules narrowly oblong, smooth, about as long as, or shorter than, the petiole. *Flowers* axillary, solitary, shortly pedunculate, about 3 in. in diam. when fully expanded; buds oblong, 1·25 in. long; spathoid bracts broadly ovate, smooth, coriaceous; peduncle ·25 in., rather stout, annulated. *Sepals* 3, linear, half the length of the petals. *Petals* 6, oblanceolate, the inner 3 slightly smaller. *Stamens* as long as the gynœcium. *Ovaries* on an elongate rachis, sessile, smooth; the style short, thick, recurved. Ripe fruit 5 to 7 in. long; individual carpels woody, rather distant, oblong, slightly apiculate, glabrous, sparsely lenticellate, ·75 to 1 in. long, 2-seeded.—*Magnolia Mannii, King MSS.*

Makum Forest, Upper Assam,—*G. Mann.*

The leaves of this resemble those of *M. montana*, Bl., but they are of thicker texture, with stouter nerves and petiole, and wider reticulations. The flowers, however, differ from those of *M. montana* in the shortness of the peduncle and of the sepals. This species has been collected only by my friend Mr. G. Mann, Conservator of Forests in Assam, a distinguished forester and enthusiastic botanist, to whom I dedicate it.

PLATE 70. Michelia Mannii, *King.*—1, flowering branch; 2, flower dissected; 3, stamens; 4, ripe fruit: *of natural size.*

10. M. MONTANA, *Bl. in Verh. Bat. Gen.* ix, *p.* 153. A glabrous tree. *Leaves* thinly coriaceous, shining, obovate or obovote-rotund, shortly and abruptly apiculate, rather suddenly narrowed to the base; nerves 10 to 12 pairs, thin, spreading; length

of blade 6 to 7·5 in., breadth about 4 in.; petiole slender, ·75 in. *Flowers* white, 1·5 in. in diam., solitary, terminal or axillary, on annulate peduncles about ·5 in. long. Buds cylindric. *Sepals* and *petals* about 8, oblanceolate or lanceolate. *Pistils* 3 to 4. *Carpels* usually single, sub-globular, compressed, 1·5 in. long; the walls lenticellate, woody, ·5 in. or more thick.—*Bl. Bijdr.* 7; *Fl. Jav. Magnol. p.* 15, *t.* 5; *Miq. Fl. Ind. Bat.* i, *pt.* ii, 17; *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 371.

Sikkim Himalaya. ? altitude,—*G. King;* Sylhet, in the Langai Forest,—*G. Mann.* Perak, King's collector. DISTRIB.—Java.

Only once collected in Sikkim. The fruit of this is not strictly that of a *Michelia*. The ovaries are few and are not inserted on an elongated axis, and usually only one developes into a carpel.

PLATE 68. Michelia montana, *Bl.*—1, flowering branch; 2, ripe carpel; 3 & 4, dehisced carpels; 5 seeds: *of natural size;* 6, ovaries; 7 anthers: *enlarged.*

7. Schizandra, *Michaux.*

Climbing glabrous shrubs with exstipulate, punctate leaves. *Flowers* unisexual, axillary, or in the axils of scales near the base of short, lateral, leafy branches. *Sepals* and *petals* 9 to 12, white, yellowish or reddish, imbricate, in 3 whorls, gradually increasing in size inwards. *Male flowers* with 5 to 15 or more *stamens;* the filaments short, free or sub-connate, often fleshy; anthers free or sub-immersed in the fleshy mass of confluent filaments; the cells round, remote. *Female flower* with many densely imbricate ovaries; the stigmas sessile; ovules 2. *Fruit* a slender spike of globose, 1- to 2-seeded berries. *Seeds* suspended; albumen fleshy; testa crustaceous. DISTRIB.—North America, mountains of temperate and tropical India and Java. Species about 6.

Synopsis of species.

Filaments monadelphous below, free above.	
Flowers more than 1 in. in diam.; fruit 6 to 9 in. long; carpels beaked . .	1. *S. grandiflora.*
Flowers less than 1 in. in diam.; fruit 3 to 4 in. long; carpels not beaked	2. *S. elongata.*
Anthers sessile in cavities of the mass formed by the connate fleshy filaments; flowers about ·5 in. in diam.	
Leaves ovate-lanceolate, 3·5 to 4·5 in. long	3. *S. propinqua.*
Leaves narrowly lanceolate or oblong-lanceolate, 2·5 to 3 in. long	4. *S. axillaris.*

1. S. GRANDIFLORA, *Hook. fil. & Thoms. Fl. Br. Ind.* i, 44. A woody climber with rugose brown branches. *Leaves* membranous, oblong-lanceolate, acuminate, with minute distant teeth; the base cuneate, often unequal; lower surface paler than the upper and with the reticulations distinct; main nerves 7 to 8 pairs; length 3 to 5 in., breadth 1·25 to 1·75 in.; peticle ·5 to ·75 in., slender. *Flowers* 1·25 in. or more in diam., solitary, pinkish-white, axillary, on slender peduncles 1·5 in. long. *Sepals* and *petals* obovate-oblong. *Filaments* above the anthers ovoid with thick connective; the cells lateral or sub-extrorse. *Fruit* 6 to 9 in. long; its axis cylindric, fleshy, coloured; *carpels*

obovoid, shortly beaked.—*Wall. Tent. Fl. Nep., t.* 14.—*Sphærostema grandiflorum, Hook. fil. & Thoms Fl. Ind.* 81.

Temperate Himalaya from Ghurwal to Bhotan, at elevations of from 6,000 to 10,000 feet.

PLATE 69A. Schizandra grandiflora, *Hook. fil. & Thoms.*—1, flowering branch with female flowers; 2, female flower; 3, male flower; 4, ripe fruit: *of natural size.*

2. S. ELONGATA, *Hook. fil. & Thoms. Fl. Br. Ind.* i, 44. A woody climber with thin, brown, lenticellate branches. *Leaves* membranous, oblong-lanceolate to ovate, acuminate or acute; the edges cartilaginous, entire, or minutely and remotely dentate; base cuneate or rounded, slightly unequal; beneath glaucous, the reticulations faint; main nerves 4 to 5 pairs; length 2 to 3·5 in., breadth 1 to 1·5 in.; petiole ·5 to ·7 in., slender. *Flowers* ·5 to ·75 in. in diam., yellowish, axillary, solitary, or in fascicles of 2 or 3 on slender, ebracteolate pedicels 1 to 1·5 in. long. *Sepals* 3, orbicular. *Petals* 6, larger than the sepals, ovate-orbicular. *Stamens* as in *S. Roxburghiana*. *Fruit* 2 to 3 in. long; the rachis very slender, swollen at intervals; *carpels* sub-sessile, globose, grooved on one side, not beaked.—*Sphærostema elongatum, Blume Fl. Jav. Schiz., t.* 5; *Hook. fil. & Thoms. Fl. Ind.* 85.—*Sphærostema grandiflorum, Wall. Cat.* 4983, *A in part & C.*

Temperate Himalaya from Nepal to Sikkim, alt. 5,000 to 6,000 feet; Khasia Hills.

DISTRIB.—Java.

PLATE 69B. Schizandra elongata, *Hook. fil.*—5, branch with male flowers; 6, branch with fruit: *of natural size;* 7, female flower dissected to show the three sepals, six petals, and gynœcium: *enlarged.*

3. S. PROPINQUA, *Hook. fil. & Thoms. Fl. Br. Ind.* i, 45. A woody climber; young branches with slender, pale brown, lenticellate bark. *Leaves* slightly fleshy, ovate-lanceolate, acuminate; edges with minute distant teeth or sub-entire; the base rounded or cuneate, slightly unequal; under surface slightly pale; the reticulations wide, not prominent; main nerves 6 to 7 pairs, faint, anastomosing far from the margin; length 3·5 to 4·5 in., breadth 1·25 to 1·4 in.; petiole ·4 to ·6 in. *Flowers* ·6 in. in diam., yellow or orange, axillary, solitary, on bracteolate pedicels as long as, or shorter than, the petioles. *Sepals* and *petals* broadly ovate or obovate; anthers 12 to 15, embedded in the conjoined globose fleshy mass of filaments. *Fruit* 6 in. long; the axis cylindric, fleshy, rough; *carpels* sub-sessile, globose, baccate, 2-seeded.—*Hook. Ic. Pl., t.* 1715.—*Sphærostema propinquum, Bl. Fl. Jav. Schizandreæ* 15; *Hook. fil. & Thoms. Fl. Ind.* 85.—*Kadsura propinqua, Wall. Tent. Fl. Nep.* 11, *t.* 15.

Western Himalaya from Gharwal to Nepal, at elevations of 4,000 to 6,000 feet.

PLATE 41A. Schizandra propinqua, *Hook. fil. & Thoms.*—1, branch with male flowers; 2, petals and androœcium of a male flower, dissected; 3, ripe fruit: *of natural size;* 4, androœcium; 5, calyx: *enlarged.*

4. S. AXILLARIS, *Hook. fil. & Thoms. Fl. Br. Ind.* i, 45. A slender woody creeper; the young branches angular, smooth. *Leaves* thinly coriaceous, narrowly lanceolate or oblong-lanceolate, much acuminate, distantly and minutely dentate or sub-entire; the base acute; lower surface pale; the reticulations wide, not prominent; nerves 5 or 6 pairs, faint; length 2·5 to 3 in., breadth ·6 to 1 in.; petiole ·5 to ·65 in. *Flowers* ·5 in. in diam., scarlet, axillary, solitary, sessile or on bracteolate pedicels shorter than the petioles.

Sepals orbicular; *petals* ovate-rotund. *Anthers* as in *S. propinqua*. *Fruit* 1 to 2 in. long; the rachis slender, smooth; *carpels* globose, sub-sessile; seeds 1 or 2.—*Sphærostema axillare*, *Bl. Bijdr.* 22; *Fl. Jav. Schizand.* 14, *t.* 3; *Hook. fil. & Thoms. Fl. Ind.* 86.

Khasia Hills, alt. 4,000 to 5,000 feet; Shan Hills, Upper Burmah, 4,000 feet,—*General Collett.*

Distrib.—Java and Sumatra.

Specimens from Java have leaves from 1 to 1·5 in. broad, and the pedicels of the flowers are much longer than in those from the Khasia Hills.

Plate 74A. Schizandra axillaris, *Bl.*—7, flowering branch: *of natural size;* 8, flower; 9, stamens: *enlarged.*

8. Kadsura, *Kaempfer.*

Climbing glabrous shrubs. *Leaves* exstipulate. *Flowers* unisexual, white, yellow or reddish, axillary or in the axils of scales near the base of short, lateral, leafy branches. *Sepals* and *petals* 9 to 12, imbricate in about 3 series. ♂ *Stamens* 5 to 15 or more, in a spiral series; filaments very short, free or sub-connate, often fleshy; anthers free or sub-immersed in a fleshy head of confluent filaments; cells small, remote. ♀ *Ovaries* many, densely imbricated; stigma sessile; ovules 2 to 4. *Fruit* a globose head of indehiscent, fleshy, 1-seeded carpels. *Seeds* 1 or 2, suspended; albumen fleshy; testa crustaceous; embryo minute. Distrib.—Temp. and sub-trop. Asia. Species about 8.

Synopsis of species.

Individual carpels mucronate or beaked.
- Leaves broadly ovate to ovate-oblong; flowers and fruit mostly axillary . . 1. *K. scandens.*
- „ ovate-rotund; flowers and fruit usually on the stem below the leaves . 2. *K. cauliflora.*
- „ ovate-lanceolate or oblong-lanceolate; filaments mostly connate . . 3. *K. Roxburghiana.*

Individual carpels truncate, not beaked.
- Leaves broadly ovate; filaments all free . . . . . 4. *K. Wightiana.*
- „ lanceolate to ovate-lanceolate . . . . . 5. *K. lanceolata.*

1. K. scandens, *Bl. Fl. Jav. Schizandreæ, p.* 9, *t.* 1. A woody, glabrous climber, 30 to 40 feet long; the bark dark-coloured, irregularly striate. *Leaves* coriaceous, broadly ovate to ovate-oblong, shortly acuminate, entire; the base rounded, very slightly decurrent along the petiole; main nerves about 5 pairs, sub-erect; length of blade 4 to 6 in., breadth 2 to 4 in.; petiole about 1 in., expanded at the base. *Flowers* axillary, with a few from the trunk below the leaves, solitary, on bracteolate peduncles; those of both sexes similar. *Calyx* of 3 triangular sepals much shorter than the petals and united at the base. *Petals* ovate-oblong, blunt, fleshy, erecto-patent, sub-concave. *Male flowers* with numerous short, cuneate, equal stamens, densely packed on an ovoid, fleshy receptacle; the connective fleshy; the anthers sub-truncate, 2-celled. *Female flowers* without stamens; the ovaries numerous, compressed; the stigmas sessile, elongate, fleshy. *Ripe fruit* sub-globose, 2 to 2·5 in. in diam.; the individual carpels sessile, globose or sub-compressed, fleshy, mucronate or beaked, less than ·5 in. in diam.—*Miq. Fl. Ind. Bat.* i, *pt.* ii, 19; *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 375.—*Sarcocarpon scandens*, *Bl. Bijdr.* 21.

Perak, Penang; at low elevations.

Distrib.—Java, Sumatra, and probably in the other islands of the Archipelago.

Plate 71. Kadsura scandens, *Bl.*—1, flowering stem; 2, stem with nearly ripe fruit: *of natural size.*

2. K. cauliflora, *Bl. Fl. Jav. Schizand.* 11, *t.* 2. A stout, woody climber, 30 to 40 feet long; bark of young shoots dark, smooth; that of the main stem corky, furrowed, lenticellate. *Leaves* ovate-rotund or broadly ovate, slightly and rather abruptly acuminate; the base broad and rounded; nerves 5 to 7 pairs, ascending; length of blade 6 to 7 in., breadth 3·5 to 4·5 in.; petiole 1 to 1·5 in. *Flowers* usually from the stem below the leaves, solitary or fascicled, on bracteolate peduncles; rarely axillary. *Sepals* and *petals* as in the last, but larger and more ovate. *Carpels* on pedicels ·5 in. long.—*Miq. Fl. Ind. Bat.* i, *pt.* ii, 19; *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 376.

Perak,—*Scortechini* and *King's collector.*

This is very near *K. scandens*, but has corky bark, larger leaves, larger and less orbicular petals, and the flowers are mostly on the old wood, and rarely axillary.

Plate 72. Kadsura cauliflora, *Blume.*—1, leafy stem; 2, stem with flowers; 3, stem with unripe fruit; 4, a flower; 5, a flower dissected,—*all of natural size.*

3. K. Roxburghiana, *Arn. in Jard. Mag. Zool. and Bot.* ii, 546. A strong, woody, glabrous climber, with rugose brown bark. *Leaves* slightly fleshy (membranous when dry), ovate-lanceolate or oblong-lanceolate, acute or shortly acuminate; the base acute; nerves 6 to 9 pairs, not prominent; reticulations minute, obscure; length 3 to 5 in., breadth 1·75 to 2 in.; petiole ·6 to ·75 in., slender. *Flowers* ·5 in. in diam., axillary, solitary, on short, stout, bracteolate pedicels which, when the fruit is ripe, lengthen to 1 in. or more. *Sepals* and *petals* 12, orbicular. *Outer filaments* short, free above; the inner connate. *Ovules* 2. *Fruit* 1 to 2 in. in diam., globular; *carpels* succulent, numerous, globular or oblong, shortly beaked.—*Hook. fil. & Thoms. Fl. Ind.* 83; *Hook. fil. Fl. Br. Ind.* i, 45; *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 376.—*Kadsura japonica, Wall. Tent. Fl. Nep., t.* 12.—*Uvaria heteroclita, Roxb. Fl. Ind.* ii, 663.

Tropical forests of the base of the Eastern Himalaya; Assam Hill ranges, ascending to 5,000 feet.

The bark of the older stems is often very rugose. The leaves when fresh are slightly fleshy, but when dry they are thin and membranous: in young plants they are often serrate-dentate, in old plants almost always entire.

Plate 73A. Kadsura Roxburghiana, *Arn.*—1, flowering branch; 2 to 4, gynœcium at various stages; 5, ripe fruit,—*all of natural size.*

4. K. Wightiana, *Arn. l. c.* ii, 546. A glabrous, woody climber, with rugose greyish-brown bark. *Leaves* slightly fleshy, broadly ovate, obtuse or acute, sometimes oblique, often denticulate in the upper half; the base cuneate; the under surface pale; nerves 7 to 9 pairs; length 2 to 3 in., breadth 1 to 2 in.; petiole ·5 in. *Flowers* ·5 in. in diam., on stout bracteolate pedicels which lengthen in fruit. *Sepals* 3, small, unequal, orbicular. *Petals* 9, oval, obtuse: the inner smaller. *Filaments* all free. *Ovules* 3 or 4. *Fruit* as in *K. Roxburghiana*, but the carpels truncate and without beaks.—*Hook. fil. & Thoms. Fl. Ind.* 84; *Hook. fil. Fl. Br. Ind.* i, 45.

Malabar, Ceylon, at elevations of 2,000 to 3,000 feet.

Closely allied to *K. Roxburghiana*, Arn., but with a more rigid habit, and smaller, more ovate leaves. The chief difference in the flowers is the distinctness of the filaments in this, and in the fruit the absence of beaks in the truncate carpels.

PLATE 74B. Kadsura Wightiana, *Arn.*—1, branch with flower and fruit: *of natural size;* 2, flower; 3, stamens; 4, pistils; 5, single carpel; 6, ripe fruit: *enlarged.*

5. K. LANCEOLATA, *King in Journ. As. Soc. Beng. vol.* 58, *pt.* ii, 376. A slender woody climber, 20 to 30 feet long. *Leaves* thinly coriaceous, lanceolate or ovate-lanceolate, slightly unequal-sided, acuminate; the base cuneate or rounded; edges slightly recurved when dry; nerves obscure, about 12 pairs; length of blade 3 to 4 in., breadth 1·5 in.; petiole ·35 in. *Flowers* solitary, axillary, globular, 3·5 in. in diam., on minutely bracteolate peduncles shorter than the petioles. *Sepals* about 3, triangular, much smaller than the petals. *Petals* about 9, rotund or broadly ovate, cream-coloured, fleshy, slightly concave. *Stamens* as in *K. scandens*. *Ripe fruit* globular, ·75 in. in diam. or less. *Pistils* numerous; the stigmas minute, sub-terminal. *Carpels* ovoid; the apices truncate; the minute lateral stigmas persistent.

Perak, at elevations of from 500 to 1,000 feet.

A smaller plant than *K. scandens*, with smaller carpels.

PLATE 73B. Kadsura lanceolata.—6, flowering branch; 7, young fruit: *of natural size;* 8, carpel; 9, a dissected flower: *enlarged.*

INDEX TO MAGNOLIACEÆ.

	Page.
Aromadendron	205
Bara Champ	215
Boramthuri	205
„ *Soppa*	207
Bor Gahori Soppa	210
Bor Soppa	218
Champ	216
Euptelea	199
„ pleiosperma, H. f. and T.	199
„ *polyandra*, Sieb. and Zucc.	199
Eu-Talauma	202
Gahori Soppa	210
Gogay Champ	215
Gordonia terminalis, Wall.	201
Illicium	199
„ Cambodianum, Hance	200
„ *Floridanum*, Ell.	200
„ Griffithii, H. f. and T.	201
„ majus, H. f. and T.	201
„ Manipurense, Watt	200
„ Simonsii, Maxim.	201
Kadsura	221
„ cauliflora, Bl.	222
„ *japonica*, Wall.	222
„ lanceolata, King	223
„ *propinqua*, Wall.	220
„ Roxburghiana, Arn.	222
„ scandens, Bl.	221
„ Wightiana, Arn.	222
Korika Soppa	206
Lal Champ	208
Liriodendron grandiflorum, Roxb.	207
Magnoliæ	199
Magnolia	200, 206
„ *Andamanica*, King Mss.	203
„ Campbellii, H. f. and T.	208
„ *excelsa*, Wall.	215
„ *Forbesii*, King.	206
„ globosa, H. f. and T.	208
„ Griffithii, H. f. and T.	209

	Page.
Magnolia Gustavi, King	209
„ *insignis*, Wall.	212
„ *Kunstleri*, King Mss.	204
„ *Mannii*, King Mss.	218
„ Maingayi, King	208
„ Pealiana, King	210
„ pterocarpa, Roxb.	207
„ *punduana*, Wall.	217
„ *Scortechinii*, King Mss.	213
„ *sphenocarpa*, Wall.	207
Manglietia	211
„ *Candollei*, Wall.	203
„ Caveana, H. f. and T.	212
„ glauca, Bl.	213
„ insignis, Bl.	211
„ „ var. angustifolia, King	212
„ *insignis*, Wall.	204
„ Sebassa, Miq.	211
„ Scortechinii, King	213
Michelia	214
„ *aurantiaca*, Wall.	216
„ Cathcartii, H. f. and T.	214
„ Champaca, Linn.	216
„ *Doldsopa*, Ham.	216
„ excelsa, Bl.	215
„ *glauca*, Wight	216
„ *Gustavi*, King	209
„ kisopa, DC.	217
„ lanuginosa, Wall.	215
„ *macrophylla*, Don	204
„ Mannii, King	218
„ montana, Bl.	218
„ nilagirica, Zenk.	216
„ „ var. Walkeri, King	216
„ oblonga, Wall.	217
„ *ovalifolia*, Wight	216
„ *Pealiana*, King Mss.	210
„ *pubinervia*, Bl.	216

	Page.
Michelia *Pulneyensis*, Wight	216
„ punduana, H. f. and T.	217
„ *Rheedii*, Wight	216
„ *rufinervis*, DC.	216
„ *velutina*, DC.	216
„ *Walkeri*, Wight	216
Phul Soppa	212, 218
Sifid Champ	216
Sarcocarpon scandens, Bl.	221
Sphenocarpus	207
Spongocarpon	202, 205
Schizandreæ	199
Schizandra	219
„ axillaris, H. f. and T.	220
„ elongata, H. f. and T.	220
„ grandiflora, H. f. and T.	219
„ propinqua, H. f. and T.	220
Sphaerotema axillare, Bl.	221
„ *elongatum*, Bl.	220
„ *grandiflorum*, Wall.	220
„ „ H. f. and T.	220
„ *propinquum*, Bl.	220
Tita Soppa	206
Talauma	202
„ andamanica, King	203
„ Forbesii, King	206
„ Hodgsoni, H. f. and T.	204
„ Kunstleri, King	204
„ lanigera, H. f. and T.	202
„ mutabilis, Bl.	203
„ phellocarpa, King	205
„ Rabaniasa, H. f. and T.	204
„ *Roxburghii*, G. Don	207
„ spongocarpa, King	205
„ villosa, Miq.	203
Trochodendreæ	199
Uvaria heteroclita, Roxb.	222
Winterieæ	199

AN

ACCOUNT

OF THE

GENUS GOMPHOSTEMMA WALL.

BY

DAVID PRAIN,

Curator of the Herbarium, Royal Botanic Garden, Calcutta;
Surgeon, Indian Medical Service.

CALCUTTA:
Printed at the Bengal Secretariat Press.
1891.

PREFACE.

In 1889 Dr. King, F.R.S., C.I.E., Superintendent of the Royal Botanic Garden, directed me to arrange the Indo-Malayan *Labiatæ* preserved in this Herbarium in accordance with Sir J. D. Hooker's article "Labiatæ" in the *Flora of British India*. While examining the material of the genus Gomphostemma, it was found that there were some new forms (mainly Malayan) that appeared to throw light on the natural disposition of its species. At Dr. King's suggestion an examination of all the material of the genus available was undertaken. The results are embodied in this paper.

The generosity of Mr. Thiselton Dyer, C.M.G., F.R.S., Director of the Royal Gardens, Kew, who has kindly directed a number of specimens illustrating the genus to be sent to the Calcutta Herbarium, has enabled me to render the paper more complete than it otherwise would have been, but it could never have been prepared at all had I not had the benefit of much kind assistance from Mr. Hemsley, F.R.S., formerly Assistant for India (now Principal Assistant) in Kew Herbarium, who has taken infinite pains to answer in detail many queries regarding particular specimens, and has carefully compared a set of specimens that correspond with the examples of the *Wallichian* and *Benthamian* Herbaria at Calcutta with the types of Dr. Wallich's species preserved in the Herbarium of the Linnean Society of London, and with the examples of the *Wallichian* and *Benthamian* Herbaria at Kew.

Mr. Ford, F.L.S., of Hong-Kong, has very generously communicated a duplicate of the only Chinese species, and Mr. E. Baker, F.L.S., has kindly replied to enquiries regarding some specimens contained in the British Museum.

The time has not yet arrived for a final revision of this genus: some forms already reported are still inadequately represented; many localities likely to yield examples are still inadequately explored. This paper therefore does not claim to be complete either in form or in matter: it is simply, as its title implies, an account, as uniform as possible with previous accounts, of the various forms hitherto reported. Reductions not warranted by the presence of the necessary intermediate forms have not only not been effected, but some forms which it may be hoped ultimately to merge in previously named species have been provisionally advanced to specific rank. The disadvantages of this method of treatment will, it is hoped, be more than counterbalanced owing to the limits of hitherto recognised species having been left unaltered. At the same time, since it is only just to future students of the genus that all the results of a somewhat prolonged study of the material now available should be put on record, the reductions indicated by structural characters as *probable* have been duly set forth in a tabular form in the introduction, and in a subordinate form in the text.

DAVID PRAIN.

Herbarium, Royal Botanic Garden, Calcutta;
1st August 1890.

CONTENTS.

Chapter I.—Introduction:—Historical—Wallich, Bentham, Meisner, Endlicher, Walpers, Wight, Miquel, Oliver, Hooker; morphology—habit, root, leaves, stem, bracts, flowers—calyx, corolla, stamens, disc, ovary, style, stigma, fruit—nutlets, embryo, cotyledons; classification of species—natural divisions of the genus, groups of species, separable forms and probable natural species compared; reductions of the Miquelian species; reductions of the Wallichian herbarium; excluded species; geographical distribution of the genus . . . . . 227—242

Chapter II.—Conspectus Specierum:—

GOMPHOSTEMMA;

§ Pogosiphon;

* *Strobilina;*

** *Hemsleyanum;*

[*** *Anthocoma*]:

§§ Stenostoma;

* *Niveum;*

** *Parviflora;*

*** *Eriocarpon:*

§§§ Eugomphostemma;

* *Lucida;*

** *Pedunculata;*

*** *Melissifolia* . . . . . 242—245

Chapter III.—Descriptions of Species:—*G. Wallichii, strobilinum, nutans, Heyneanum; Hemsleyanum: niveum; microcalyx, Thomsoni, parviflorum, crinitum; eriocarpon: Philpiipnarum, Scortechinii, oblongum, javanicum, rugosum, lucidum, phlomoides; pedunculatum, Curtisii, chinense; Mastersii, velutinum, ovatum, melissifolium* . . . . . 245—271

LIST OF PLATES.

Plate 75. Gomphostemma Wallichii *Prain.*

„ 76. G. strobilinum *Wall.* var. typica.

„ 77. G. strobilinum *Wall.* var. viridis *Hook. f.*

„ 78. G. strobilinum *Wall.* var. acaulis *Prain.*

„ 79. G. Heyneanum *Wall.* var. typica.

„ 80. G. Heyneanum *Wall.* var. Rottleri *Prain.*

„ 81. G. nutans *Hook. f.*

„ 82. G. Hemsleyanum *Prain.*

„ 83. G. niveum *Hook. f.*

CONTENTS.

PLATE 84. G. microcalyx *Prain*.
„ 85. G. Thomsoni *Benth*.
„ 86. G. parviflorum *Wall*. VAR. typica.
„ 87. G. parviflorum *Wall*. VAR. farinosa *Prain*.
„ 88. G. crinitum *Wall*. VAR. typica.
„ 89. G. crinitum *Wall*. A. VAR. typica; B. VAR. Griffithii *Prain*.
„ 90. G. eriocarpon *Benth*.
„ 91. G. pedunculatum *Benth*.
„ 92. G. Curtisii *Prain*.
„ 93. G. Scortechinii *Prain*.
„ 94. G. lucidum *Wall*.
„ 95. G. oblongum *Wall*.
„ 96. G. ovatum *Wall*.
„ 97. G. chinense *Oliv*.
„ 98A. G. velutinum *Benth*.; B. G. Mastersii *Benth*.
„ 99. G. Mastersii *Benth*.
„ 100. G. melissifolium *Wall*.
„ 101. G. Philippinarum *Benth*.
„ 102. G. javanicum *Benth*.
„ 103. G. rugosum *Prain*.
„ 104. G. phlomoides *Benth*.
„ 105. Sketch-map of South-Eastern Asia illustrating the distribution of the genus Gomphostemma.

AN

ACCOUNT

OF THE

GENUS GOMPHOSTEMMA WALL.

CHAPTER I.—INTRODUCTION.

THE name of the Labiate genus GOMPHOSTEMMA[1] first appeared in the lithographed catalogue of the Indian Herbarium distributed by Wallich[2] in 1828 and subsequent years. Wallich had, however, recognised the genus (as appears from a MS. note in the Calcutta Herbarium) eight years before to accommodate two species—one (*G. ovatum*), collected by himself in Nepal, and another (*G. melissifolium*), introduced into the Calcutta Garden from Silhet by Roxburgh. This latter species Roxburgh had in 1814 referred to the genus PRASIUM;[3] the same was done by Blume in 1826 with two Java species described by him;[4] GOMPHOSTEMMA of Wallich is thus equivalent to *PRASIUM* of Roxburgh and of Blume, but not of Linnæus. In 1828 Wallich issued along with these two species seven others,[5] and in 1829 he added two more.[6] Bentham described all these in 1831,[7] re-described them in 1835,[8] and described them a third time in 1848.[9] Meisner in 1837[10] and Endlicher about 1838[11] published definitions of the genus, Walpers in 1845 reprinted Bentham's account of 1835,[12] Moritzi described a Java species in 1846,[13] Wight figured the two S. Indian species in 1850,[14] and Miquel described the species of the Dutch East Indies in 1856.[15] Bentham defined the genus anew in 1876,[16] Oliver described a Chinese species in 1884,[17] and Hooker those of the British East Indies in 1885.[18]

[1] GOMPHOSTEMMA. γομφος (a nail), στεμμα ; the two species to which the name was first applied have prostrate stems rooting at the internodes.

[2] *Lith. Cat.* p. 39.

[3] *Roxb., Hort. Beng.* 45 ; *Flor. Ind.* iii, 26.

[4] *Blume, Bijdr.* 840.

[5] *Lith. Cat.* nn. 2151—2159.

[6] *Lith. Cat.* nn. 2709, 2710.

[7] *Wall., Pl. As Rar.* ii, 12, 13.

[8] *Lab. Gen. et Sp.* 646—650.

[9] *DC., Prodr.* xii, 550—552.

[10] *Meisn., Gen. Pl. Vasc.* i, 289 ; ii, 197.

[11] *Endl., Gen. Pl.* 630, (*fasc.* 3).

[12] *Walp., Rep.* iii, 896—898 ; vi, 684.

[13] *Zoll. et Moritz., Syst. Verzeichn.* 54.

[14] *Icones* iv, tt. 1456, 1457 ; *Ill.* 222, t. 1764, f. 9.

[15] *Flor. Ind. Bat.* ii, 985—989.

[16] *Benth. et Hook. f., Gen. Pl.* ii, 1216.

[17] *Hook., Icon. Pl.* xv, 54, t. 1468.

[18] *Flor. Brit. Ind.* iv, 696—699.

The genus GOMPHOSTEMMA belongs to the Labiate tribe PRASIEÆ. It consists of coarse perennial herbs, sometimes (*G. lucidum*) almost shrubby, with obscurely 4-angled stems, sometimes deeply grooved (*G. strobilinum*). The rootstock is woody, the roots usually being fibrous, sometimes, however, with fusiform tubers interspersed (*G. Mastersii*). The leaves are always opposite, generally petioled, but sometimes the petioles are short (*G. Scortechinii*) or almost absent (*G. niveum*). The lamina is usually large and generally ovate or elliptic, less often lanceolate or oblanceolate; the margin is usually serrate or crenate, rarely (*G. niveum*) subentire, nearly always acute at the apex and cuneate at the base. The stems are either scurfily scabrid or densely tomentose with stellate hairs; the petioles are the same, but are often softly tomentose when the stem is scabrid only; the under surface of the leaf is tomentose with stellate hairs, usually uniformly so, though sometimes (*G. Mastersii*) the tomentum is confined to the nerves only; the upper surface is very rarely stellate-hirsute (*G. velutinum, Mastersii*), but is usually hirsute or hispid with simple hairs, very rarely glabrous (*G. niveum, melissifolium*). The bracts are nearly always small, but are usually foliar, tomentose externally with stellate hairs, hispid or hirsute above or less often glabrous, especially in the centre. The bracteoles, to which the same remarks apply, are small and usually linear or lanceolate, and shorter than the calyx. The flowers, which are large for this order, are whorled; the whorls are either condensed into terminal spikes or else are axillary and distant, in the lower axils or along the stem below the leaves, the upper axils being barren. The calyx is generally sessile, and the whorls are generally crowded; in some species with crowded flowers the calyx is pedicelled (*G. Scortechinii*); in a few species the whorls are occasionally (*G. Mastersii, G. strobilinum* VAR. *acaulis*), or as a rule (*G. parviflorum, G. pedunculatum*) laxly cymose with pedicelled flowers. The calyx is campanulate, 10-nerved and 5-toothed, the teeth being almost equal and varying from broadly triangular (*G. pedunculatum*) to linear (*G. crinitum*); the outside is even or ribbed, and always distinctly stellate-tomentose; the inside of the tube often is glabrous within (*G. Curtisii, nutans*): the teeth are, however, hirsute; usually both tube and teeth within are uniformly hispid or hirsute with straight hairs. In most cases the calyx is some shade of green; in two (*G. pedunculatum, Curtisii*), it is claret-red; in one (*G. Mastersii*) it is purplish. In two species (*G. Heyneanum, Hemsleyanum*) the corolla hardly exceeds the calyx; in all the rest it is distinctly, and in most cases much, longer than the calyx. The corolla tube below is slender and uniform, and where it is enclosed in the calyx is glabrous externally. This uniform portion is hirsute anteriorly within in § POGOSIPHON; in the other divisions of the genus the tube within is quite glabrous. The upper portion of the tube is always enlarged; in § STENOSTOMA this enlargement is slight and the whole tube is nearly straight; in the rest of the genus the enlargement is considerable, and the inflated part of the tube is distinctly incurved. The limbus is 2-lipped, the lips being larger in § EUGOMPHOSTEMMA than in the other divisions of the genus; the upper lip is vaulted and usually entire, rarely emarginate, the lower is patent and 3-fid with a subtruncate mid-lobe larger than the others. The corolla is generally yellow, rarely white, still more rarely pink or purplish. The 4 stamens ascend under the upper lip, the anterior pair being the longer, the filaments are always pubescent with simple hairs, and are inserted at the top of the uniform portion of the tube; the anthers approach each other in pairs; their cells are transverse, equal, parallel, and naked. The disc is subequal or is slightly swollen behind; the ovary is 4-partite, glabrous or (less often) hirsute with simple hairs; the style is glabrous or rarely (*G. Scortechinii, lucidum*) hirsute with simple spreading hairs near the apex; the stigma is 2-fid with subulate

lobes, the lower being slightly the longer. The fruit consists of drupaceous or baccate nutlets of considerable size with a fleshy or (rarely) corky pericarp and a broad, somewhat oblique hilum; the nutlets are generally glabrous, though in most cases where the ovary is hirsute they are hispid with simple hairs. All four nutlets develop as a rule in § Eugomphostemma, in § Pogosiphon it is usual for one or more to be aborted, and in § Stenostoma only one of the four nutlets becomes normally developed. The usual shape is broadly ovate or oblong with generally the upper end wider than the lower, in one group (*Parviflora*) they are ovoid and narrowed upwards; in one species (*G. eriocarpon*) they are globose. The colour of the nutlets has been little noted; in two species (*G. lucidum*, *oblongum*) the fruit is white, in another (*G. melissifolium*) it is dark red or orange. The embryo is straight and hardly fills the nutlet, the cotyledons are usually somewhat unequal.

There are distinguishable in this genus three *divisions* or *series*, which, however, hardly deserve to be recognised as Sections. Although in the text these are provided with distinctive names and definitions, this has been done rather for the sake of convenience than because sectional or even subsectional rank is claimed for them. The divisions are:—

§ Pogosiphon, which includes species where the corolla tube is hirsute within; in this it is usual for one or more of the nutlets to be abortive:

§§ Stenostoma, where the throat of the corolla is comparatively narrow and the tube is nearly straight; in this it is very unusual for more than one nutlet to be developed:

§§§ Eugomphostemma, with an incurved tube as in Pogosiphon, but glabrous within and very much longer and larger; in this all the four nutlets usually become developed.

The most compact and natural of these divisions is the second (Stenostoma).

Much more natural than these divisions are the "groups" of species into which the genus separates itself. In some instances (*e.g.*, *Parviflora*, *Lucida*) it might be convenient to deal with the constituent "species" as only somewhat distinct forms or varieties of one very variable plant. In the meantime, however, and until the whole area occupied by the genus shall have been more fully explored, it seems preferable to give descriptions of the whole of the separable forms as yet reported and (provisionally at least) to recognise these as "species." In doing this the lines laid down by Mr. Bentham and by Sir Joseph Hooker in their admirable accounts of the genus have been followed as closely as possible. But while this has been done, it may not be out of place to indicate briefly the reductions which a somewhat prolonged study of the material at present available suggests. These can be best shown in a tabular presentation; the details are given in each case in the text that refers to the *group* involved.

TABLE I.—*Comparative view of artificial and probable natural species.*

Group.	Artificial "species" of present paper.		Probable *natural* position.	
Strobilina ...	1. G. Wallichii		*a.* G. strobilinum	SUB-SP. 1. genuina; *var. a.* elatius *Benth.* (*G. Wallichii*).
	2. G. strobilinum	*a. var.* typica ...		,, *β.* typica (*G. strobilinum* var. *typica*).
		β. var. viridis ...		,, *γ.* nana (vars. *viridis* and *acaulis*).
		γ. var. acaulis ...		SUB-SP. 2. nutans (*G. nutans*).
	3. G. nutans			
	4. G. Heyneanum	*a. var.* typica ...	*b.* G. Heyneanum	*var. a.* typica.
		β. var. Rottleri ...		*var. β.* Rottleri.
Hemsleyanum	5. G. Hemsleyanum		*c.* G. Hemsleyanum.	
[Anthocoma] ...	[— G. (Anthocoma) flavescens] ...		[—G.? flavescens.]	
Niveum ...	6. G. niveum		*d.* G. niveum.	
Parviflora ...	7. G. microcalyx		*e.* G. microcalyx.	
	8. G. Thomsoni		*f.* G. parviflorum	*var. a.* farinosa (*G. parviflorum* var. *farinosa*).
	9. G. parviflorum	*a. var.* typica ...		*var. β.* typica (*G. parviflorum* var. *typica* and *G. dichotomum*).
		β. var. farinosa ...		*var. γ.* crinita (*G. crinitum* var. *typica* and *G. Thomsoni*).
	[— G. dichotomum]			*var. δ.* Griffithii (*G. crinitum* var. *Griffithii*).
	10. G. crinitum	*a. var.* typica ...		
		β. var. Griffithii ...		
Eriocarpon ...	11. G. eriocarpon		*g.* G. eriocarpon.	
Lucida ...	12. G. Philippinarum		*h.* G. oblongum	SUB-SP. 1. genuina; *var. a.* typica (*G. Philippinarum*, *G. Scortechinii*, and *G. oblongum*).
	13. G. Scortechinii	*a. var.* typica ...		*var. β.* parvifolia (*G. javanicum* and *G. rugosum*).
		β. var.? Helferi ...		SUB-SP. 2. leiocarpon;
	14. G. oblongum			*var. γ.* lucida (*G. lucidum* var. *typica*).
	15. G. javanicum			*var. δ.* canescens (*G. lucidum* var. *canescens*).
	16. G. rugosum			
	17. G. lucidum	*a. var.* typica ...		
		β. var. canescens ...		
	18. G. phlomoides		*j.* G. phlomoides.	
Pedunculata	19. G. pedunculatum		*k.* G. pedunculatum.	SUB-SP. 1. genuina (*G. pedunculatum*).
	20. G. Curtisii			SUB-SP. 2. Curtisii (*G. Curtisii*).
	21. G. chinense		*l.* G. chinense.	
Melissifolia ...	22. G. Mastersii		*m.* G. Mastersii.	
	23. G. velutinum		*n.* G. velutinum.	
	24. G. ovatum		*o.* G. ovatum.	
	25. G. melissifolium		*p.* G. melissifolium.	

From this table it will be seen that there are only 16 species which are separable from each other by unexceptionable characters. At the same time it has to be admitted that the

intermediate forms necessary to support the decisive reductions indicated in the right-hand column have in few cases yet been reported.

The account of the genus by Dr. Miquel in *Flor. Ind. Bat.* ii, 985—9, is somewhat unsatisfactory.[1] But reference to it as regards Malayan species is absolutely essential, and to facilitate this a tabular view of its synonymy is presented.

---

[1] This account is unsatisfactory mainly owing to the inclusion by its author of three plants that plainly do not belong to the genus (*G. petiolare, membranifolium, macrophyllum*), and one (*G. flavescens*) the position of which is doubtful. These must be considered in detail, and in discussing them the best known will be first dealt with. This is *G. membranifolium*, of which the synonymy and distribution (as evidenced by specimens in Herb. Calcutt.) are given below:—

Phlomis rugosa Benth. in Wall. Cat. n. 2067 (1828), Pl. As. Rar. i, 63 (1830), Lab. Gen. & Sp. 634 (1834) *et* DC. Prodr. xii, 545 (1848); Walp., Rep. iii, 889 (1845); Hook. f., Flor. Brit. Ind. iv, 643 (1885).—*Gomphostemma membranifolium* Miq., Flor. Ind. Bat. ii, 988 (1856).

Area geogr. Himalaya; Sikkim, *Hooker! Clarke! Kurz! King!* Assam; Mishmi, *Griffith!* Khasia, *Wallich! Hooker & Thomson! Clarke! Mann!* Malaya; Perak, *Scortechini! Kunstler!* Java, *Horsfield!* Philippines, *Vidal* n. 3418!

This is an aberrant *Phlomis*, and the specific name (as Sir J. D. Hooker *l.c.* has remarked) is inappropriate. Besides being so unlike other *Phlomides* in general appearance, it differs from most other species of the genus in the posterior filaments being inappendiculate. Dr. Miquel's description is remarkably inadequate, and notices neither the *divaricate* anthers, the *glabrous* filaments, nor the *annulate* corolla—three characters exhibited by no species of the genus in which he has placed the plant.

After Bentham's *Phlomis rugosa* we may consider *G. macrophyllum* Miq., of which there are specimens at Calcutta. It is a plant undoubtedly congeneric with *Phlomis rugosa*, differing only in having the calyx rather longer and distinctly incurved, the corolla tube included, the lips shorter (the lateral lobes of the lower lip are besides acute instead of obtuse), the galea externally much more densely tomentose, and the anterior style-lobe longer. In habit the two species agree exactly and their nutlets are not distinguishable. If therefore the preceding species is truly to be referred to *Phlomis*, this also must be; its synonymy and distribution are then as follows:—

Phlomis oblongifolia.—*Leonurus oblongifolius* Blume, Bijdr. 828 (1826); Benth., Lab. Gen. & Sp. 552 (1833) *et* DC. Prodr. xii, 502 (1848); Walp., Rep. iii, 812 (1845).—*Gomphostemma macrophyllum* Miq., Flor. Ind. Bat. ii, 988 (1856).

Area geogr. Malaya; Java, *Blume! Kurz!* Celebes, *Forster.*

We can now consider the first of these species, *G. petiolare*, of which there is no specimen at Calcutta. Miquel expressly admits that he had only seen an imperfect specimen, but states that as regards habit it approaches his *G. membranifolium; i.e.*, Phlomis rugosa *Bth.* Blume, whose description is much too brief, made it congeneric with his *Leonurus oblongifolius*, which is Miquel's *G. macrophyllum*, and which we *know* to be congeneric with Bentham's *Phlomis rugosa*. If therefore Blume is right in making this congeneric with his *Leonurus oblongifolius*, and if at the same time Bentham's plant is correctly placed in the genus *Phlomis*, this also is a *Phlomis*. Blume, it should be noted, did not consider it related to *Gomphostemma*, a genus which he did not recognise since, like Roxburgh, he treated the species of it that he knew as *Prasia*. The synonymy and area of this plant are therefore:—

Phlomis javanica.—*Leonurus javanicus* Blume, Bijdr. 828 (1826); Benth., Lab. Gen. & Sp. 552 (1833) *et* DC. Prodr. xii, 502 (1848); Walp., Rep. iii, 812 (1845).—*Gomphostemma petiolare* Miq., Flor. Ind. Bat. ii, 987 (1856).

Area Geogr. Malaya; Java, *Blume.*

Finally, we have to consider the doubtful species *G. flavescens*. This plant was collected by Zollinger in Java, and was by him made the type of a new Labiate genus *Anthocoma* in 1846. In the absence of specimens it is only possible to discuss the descriptions that have been given of the plant. The original account has not been accessible to me, but Hasskarl's description (1847), which seems, judging from his account of the nutlets, to have been made from a specimen, has been accessible, and is tolerably full. All references to the plant subsequent to Hasskarl's have had to be made without seeing specimens. Hasskarl suggests (Flora xxx, 596) that this may be the same as Zollinger and Moritzi's *Gomphostemma dichotomum* (Verzeichn. 54); this suggestion A. de Candolle adopts in an editorial note to Bentham's description of *G. dichotomum* (Prodr. xii, pp. 552 *et* 700). De Candolle says that neither Zollinger's generic nor specific description of *A. flavescens* can separate that plant from *G. dichotomum*, but, as Miquel points out (Flor. Ind. Bat. ii, 988), this is far from being the case. *G. dichotomum* "tubo corollino subfiliformi faucem versus tantum [*sphalmate* tandum] dilatato (nec ut in reliquis Gomphostemmatis supra medium inflato)" is clearly a member of the division Stenostoma, and therefore must differ greatly from *Anthocoma flavescens* in having a corolla-tube longer than the calyx and quite glabrous within as well as in having normally only one nutlet developed. Then Bentham, who *has*

TABLE II.—*Synonymy of the article* GOMPHOSTEMMA *in Miquel, Flor. Ind. Bat.*

Miquelian name.	Name in present paper.	REMARKS.
1. G. phlomoides ...	G. phlomoides *Bth.*	
2. G. oblongum ...	G. javanicum *Bth.* ...	Miquel under *G. oblongum* includes three plants:—1. G. oblongum *Wall. Cat.* n. 2154, apparently not yet found in the Dutch territories; 2. *G. oblongum* Moritzi, Syst. Verzeichn., 53, not of Wallich—which is = G. javanicum *Benth.*; 3. *G. oblongum* Wight, Ic. iv, t. 1457, not of Wallich—which is = G. eriocarpon *Benth.*
3. G. javanicum ...	G. javanicum *Bth.*	
4. G. dichotomum ...	G. parviflorum *Wall.* ...	This plant cannot be distinguished by its description from *G. parviflorum.*
5. G parviflorum ...	G. parviflorum *Wall.* ...	Miquel has not distinguished between the two plants mixed under this name, and does not claim the presence of either in the Dutch territories.
6. G. crinitum ...	G. crinitum *Wall.* ...	Nor does Miquel claim this as present in the Dutch territories.
7. G. petiolare *Miq.* ...	.....	Certainly does not belong to the genus; is almost certainly congeneric with *Phlomis rugosa* Benth.
8. G. flavescens *Miq.* ...	G.? flavescens *Miq.* ...	Somewhat doubtfully referable to this genus.
9. G. membranifolium *Miq.*	.....	This is *Phlomis rugosa Benth.*, and certainly does not belong to the genus *Gomphostemma.*
10. G. macrophyllum *Miq.*	.....	A plant undoubtedly congeneric with *Phlomis rugosa* Benth.
11. G. strobilinum ...	G. strobilinum *Wall.* VAR. typica.	Not claimed as present in Dutch territory.
12. G. viride ...	G. strobilinum *Wall.* VAR. viridis.	Ditto ditto.

seen *G. dichotomum*, speaks of it as very nearly related to *G. parviflorum*; its nutlets should therefore be glabrous and elliptic, and thus altogether unlike those of *Anthocoma flavescens* as described by Hasskarl.

So far, indeed, does Hasskarl's description differ from the accounts of *G. dichotomum* that it is doubtful if Zollinger's ANTHOCOMA has not been gratuitously referred to the genus GOMPHOSTEMMA by Hasskarl, De Candolle, and Miquel; Bentham (*Gen. Pl.* ii, 1216) thinks that the account refers rather to a *Phlomis* than to a *Gomphostemma*. But if Hasskarl's description is in all points exact, this will hardly be the case, since no *Phlomis* has parallel anther-cel's, while the account of the corolla of *ANTHOCOMA* is precisely that of the corolla of a *Gomphostemma* of the § POGOSIPHON, in which division it might, so far as this is concerned, be accommodated along with *G. Hemsleyanum.* The "*achænia,*" however, "*dorso convexa et hirsuta*" (Hasskarl) are such as might belong to § EUGOMPHOSTEMMA * *Lucida*, and therefore if, after confirmation of the account of the anther-cells, the plant is referred indubitably to *Gomphostemma* it must at least be considered representative of a separate group. However, until specimens of this plant are obtained an authoritative opinion on its true position cannot be pronounced. Its synonymy is as follows, the different genera proposed being placed in separate columns:—

ANTHOCOMA FLAVESCENS Zoll., Nat. en Geneesk. Arch. ii, 569 (1846); Hasskarl, Flora xxx, 596 (1847).	GOMPHOSTEMMA FLAVESCENS Miq., Flor. Ind. Bat. ii, 987 (1856).—*G. dichotomum ?* Hassk., Flora xxx, 596 (1847).—*G. dichotomum*, A. DC. Prodr. xii, 552 *et* 700 (1848), *nec* Zoll. et Mor. in Syst. Verzeichn., *nec* Walp. Rep. vi, *nec* Benth. in DC. Prodr. xii.	PHLOMIS ? sp. Benth. in Gen. Pl. ii, 1216 (1876).

AREA GEOGR. MALAYA; Java, *Zollinger* n. 2418.

The type specimens of the Wallichian Herbarium are preserved in the Herbarium of the Linnean Society of London. They have formed the basis of all the accounts of the genus prior to the most recent and the best (that by Sir Joseph Hooker in the *Flora of British India*). Mr. W. B. Hemsley has very kindly compared a set of specimens that agree with the various Wallichian numbers at Calcutta with the specimens that correspond to these numbers in the type Herbarium, with the present condition of which the writer has thus become acquainted. For convenience of reference the Wallichian names, as indicated by these specimens, are in the subjoined table presented alongside of those that the same plants bear in the present paper:—

TABLE III.—*Reductions of the Wallichian Herbarium.*

2151/1.	Gomphostemma strobilinum *Wall.*	=	G. strobilinum *Wall.* VAR. typica.
2151/2.	G. strobilinum *Wall.* VAR. elatius *Benth.*	=	G. Wallichii *Prain.*
2152/1.	G. Heyneanum *Wall.*	=	G. Heyneanum *Wall.* VAR. typica.
2152/B.	G. Heyneanum *Wall.*	=	G. Heyneanum *Wall.* VAR. typica.
2152/C.	G. Heyneanum *Wall.*	=	G. Heyneanum *Wall.* VAR. Rottleri *Prain.*
2153.	G. viride? *Wall.*	=	G. strobilinum *Wall.* VAR. viridis *Hook. f.*
2154.	G. oblongum *Wall.*	=	G. oblongum *Wall.*
2155.	G. ovatum *Wall.*	=	G. ovatum *Wall.* VAR. typica.
2156/1.	G. lucidum *Wall.*	=	G. rugosum *Prain.*
2156/2.	G. lucidum *Wall.*	=	G. lucidum *Wall.*
2157.	G. melissifolium *Wall.*	=	G. melissifolium *Wall.*, in part. G. Mastersii *Benth.*, in part.
2158/1.	G. parviflorum *Wall.*	=	G. parviflorum *Wall.* VAR. typica.
2158/2.	G. parviflorum *Wall.*	=	G. parviflorum *Wall.* VAR. farinosa *Prain*, in part. G. crinitum *Wall.* VAR. typica, in part.
2158/C.	G. parviflorum *Wall.* (same plant as 2159/1)	=	G. crinitum *Wall.* VAR. typica.
2158/D.	G. parviflorum *Wall.*	=	G. parviflorum *Wall.* VAR. farinosa *Prain.*
2158/E.	G. parviflorum *Wall.*	=	G. parviflorum *Wall.* VAR. typica.
2159/1.	G. crinitum *Wall.* (afterwards 2158/C)	=	G. crinitum *Wall.* VAR. typica.
2159/2.	G. crinitum *Wall.*	=	G. crinitum *Wall.* VAR. typica.
2709.	G. velutinum *Benth.*	=	G. velutinum *Benth.*
2710.	G. eriocarpon *Benth.*	=	G. eriocarpon *Benth.*

The following table exhibits the species that have to be excluded from the genus; besides these, G. flavescens *Miq.* (*Anthocoma flavescens* Zoll.) is only doubtfully referable to it.

TABLE IV.—*Excluded Species.*

G. petiolare *Miq.*	=	Phlomis javanica (*Leonurus javanicus* Bl.)
G. membranifolium *Miq.*	=	Phlomis rugosa *Benth.*
G. macrophyllum *Miq.*	=	Phlomis oblongifolia (*Leonurus oblongifolius* Bl.)
G. insuave *Hance, Jour. Bot.* (1884), p. 231	=	Microtœna cymosa *Prain; Hook. Ic. Pl.* t. 1872.

So far as is at present known, the genus is confined to the phytogeographical province of South-Eastern Asia. Species have been reported from the South-Indian Peninsula, the central and eastern portions of the Himalaya, Yunnan, South-East China, the Indo-Chinese Peninsula, the Andaman Islands, the Malay Isthmus (Tenasserim) and Peninsula, Java, Madura, and the Philippines. No species has been reported either from Sumatra, from Borneo, or from Celebes (the Celebes' G. *macrophyllum* of Miquel does not belong to the genus). But as one species occurs in the Philippines, while four are reported from Java and Madura, and four occur in the Malay Peninsula, we may

expect that the genus will yet be reported both from Borneo and from Sumatra. Whether it may occur in Celebes is rather more doubtful, and Baron von Mueller has kindly assured me that it has not yet been reported from New Guinea or from tropical North Australia. The richest district so far as is at present known is Assam, but it may be expected that in course of time some of the remaining Indo-Chinese districts which are at present very inadequately known will yield perhaps as many species as does Assam.

In discussing the distributional features of the genus, it is clear that the idea conveyed by an exhibition of all the forms described in the text would be somewhat misleading, since from what has been said above it is evident that they are of rather unequal morphological and systematic value. For even if it be convenient to continue to recognise forms like *G. crinitum* or *G. Philippinarum* as specifically separable from their nearest allies, they must nevertheless be looked upon as nothing more than representatives in their respective localities of these allies. Following, therefore, the example of Sir Joseph Hooker in his essay on the *Distribution of Arctic Plants* (*Trans. Linn. Soc.* xxiii) the 'natural' groups given in the right-hand column of Table I as well as the 'artificial' species enumerated in the left-hand column are employed in calculating percentages. The subjoined table and the map which illustrates it exhibit fully the distribution both of these groups and of the recognisable forms that constitute them.

Table V.—*Distribution of the genus* Gomphostemma.

Division.	Group.	Species.	S. E. China.	Yunnan.	Burma.	Assam.	E. Himalaya.	C. Himalaya.	Andamans.	Tenasserim.	Siam.	Tonquin.	Malaya.	Sumatra.	Java.	Borneo.	Philippines.	S. India.
Pogostephon.	Strobilina ...	*a.* G. strobilinum, sub-sp. genuina; *var.* elatius *Benth.* (1. *G. Wallichii*) ...	...	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...
		var. typica (2. *G. strobilinum* type)	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
		var. nana (2. *G. strobilinum* vars. β and γ)	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...
		sub sp. nutans (3. *G. nutans*)	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...
		b. G. Heyneanum (4. *G. Heyneanum*) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
	Hemsleyanum .	*c.* G. Hemsleyanum (5. *G. Hemsleyanum*)	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
	[Anthocoma ...	— G. flavescens (*Anthocoma flavescens* Zoll.)	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...]
Stenostoma.	Niveum ...	*d.* G. niveum (6. *G. niveum*) ...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
	Parviflora ...	*e.* G. microcalyx (7. *G. microcalyx*) ...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
		f. G. parviflorum, *var.* farinosa (9. *G. parviflorum* var. β = *G. multiflorum* Benth.)	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...
		var. typica; *form* = *true* G. parviflorum (9. *G. parviflorum* var. α)	...	...	1	1	...	...	...	...	1	...	...	...	...	...	...	...
		form = G. dichotomum *Zoll. & Mor.* ...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
		var. crinita; *form* = G. Thomsoni (8. *G. Thomsoni*)	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
		form = *true* G. crinitum (10. *G. crinitum* var. α)	...	...	1	1	...	...	...	1	...	...	1	...	...	...	...	...
		var. Griffithii (10. *G. crinitum* var. β)	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
	Eriocarpon ...	*g.* G. eriocarpon (11. *G. eriocarpon*) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1

TABLE V.—*Distribution of the Genus* GOMPHOSTEMMA—concluded.

Division.	Group.	Species.	S. E. China.	Yunnan.	Burma.	Assam.	E. Himalaya.	C. Himalaya.	Andamans.	Tenasserim.	Siam.	Tenpain.	Malaya.	Sumatra.	Java.	Borneo.	Philippines.	S. India.
EUGOMPHOSTEMMA.	Lucida ...	*h.* G. oblongum, SUB-SP. genuina; *var.* typica; *form* = G. Philippinarum (12. *G. Philippinarum*)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		form = G. Scortechinii (13. *G. Scortechinii*)	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	...
		form = *true* G. oblongum (14. *G. oblongum*)	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...
		var. parvifolia; *form* = G. javanicum (15. *G. javanicum*)	...	..	..	...	...	...	...	...	...	...	...	...	1	...	...	..
		form = G. rugosum (16. *G. rugosum*)	...	...	...	...	...	...	..	1	...	...	...	...	1	...	...	...
		SUB-SP. leiocarpon; *var.* lucida (17. *G. lucidum* type) ...	...	1	1	1	...	—	...	...	...	...	...	...	...	...	...	...
		var. caneseens (17. *do.* var. β)	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...
		j. G. phlomoides (18. *G. phlomoides*) ...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	..
	Pedunculata ...	*k.* G. pedunculatum, SUB-SP. genuina (19. *G. pedunculatum*)	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
		SUB-SP. Curtisii (20. *G. Curtisii*) ...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	—	...
		l. G. chinense (21. *G. chinense*) ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Melissifolia ...	*m.* G. Mastersii (22. *G. Mastersii*) ...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
		n. G. velutinum (23. *G. velutinum*) ...	..	...	...	1	...	...	...	...	...	...	..	.		...	...	..
		o. G. ovatum (24. *G. ovatum*)	...	...	...	1	1	1	...	...	...	...	.	...	...	...	.	..
		p. G. melissifolium (25. *G. melissifolium*)	...	..	...	1	...	...	...	...	...	...	.	...	—	...	...	..

The district of South-Eastern China has only one species (*G. chinense*). This is however widely distributed in the district, occurring in the island of Hainan and in the provinces of Kwangtung and Fokien, and is, besides, very distinct. South-Eastern China may therefore be considered a district phytogeographically distinct.

In South-Western Yunnan two species have been found (*G. Wallichii*, *G. lucidum*); both appear in precisely the same form in Upper Burma. Siam has hitherto yielded only one (*G. parviflorum* var. *typica*), which also appears in Burma. Both districts must therefore be annexed to Burma. Burma (including Upper Burma of political geography, but excluding Martaban-Tenasserim—or the Malay Isthmus) has yielded eight forms, but these are of very unequal morphological value. Besides the three mentioned already, which all of them extend to Assam, these include *G. Hemsleyanum*, which is very distinct and is endemic; *G. nutans*, which extends to Assam; *G. crinitum* (type), which extends to Assam on the one hand and to the Malay Isthmus and Peninsula on the other; *G. strobilinum* (type) and *G. strobilinum* var. *acaulis*. The last two are endemic, and are confined to Lower Burma (Pegu and Arracan), but belong to a species very nearly related to the Upper Burma, Assam and Yunnan *G. Wallichii*, while another variety of the same species, *G. strobilinum* var. *viridis* (which is indeed hardly varietally separable from var. *acaulis*) occurs in the Malay Isthmus (Tavoy).

The subjoined table shows the distribution of the species of Burma, Yunnan, and Siam :—

TABLE VI.—*Table of distribution for* Burma (*including* Siam *and* W. Yunnan).

NAME OF SPECIES.	Endemic.		To Assam.		To Tenasserim.	
G. strobilinum (2 vars.)	$\frac{2}{3}$	$\frac{1}{4}$	...	$\frac{2}{3}$	...	$\frac{1}{12}$
G. Wallichii	...		1		...	
G. nutans	...		1		...	
G. parviflorum (1 var.)	...	...	$\frac{1}{2}$	$\frac{1}{2}$	...	$\frac{1}{4}$
G. crinitum (1 var.)	...		$\frac{1}{2}$		$\frac{1}{2}$	
G. Hemsleyanum	1	1	...	...	...	...
G. lucidum (1 var.)	...	...	$\frac{1}{4}$	$\frac{1}{4}$	...	...
Totals of artificial species	$1\frac{2}{3}$		$3\frac{1}{2}$		$\frac{1}{2}$	
Percentages of ditto	32·2°/₀		67·7°/₀		9·6°/₀	
Totals from probable natural species	$1\frac{1}{4}$		$1\frac{5}{12}$		$\frac{1}{3}$	
Percentages from ditto	46·8°/₀		53·1°/₀		12·5°/₀	

The degree of isolation indicated by the endemic percentage of the district is considerable, and is markedly increased when approximately natural units are employed in calculating it. At the same time the use of this method decreases instead of increasing the percentages marking connection with Assam, thus indicating the possibility of these being districts that are phytogeographically distinct. But the percentage of species extending to Assam still outbalances the endemic percentage; we cannot therefore from the evidence of the Burmese species alone propose to recognise them as separate districts. The use of approximately natural units brings out on the other hand a rather greater degree of connection between Burma and Tenasserim, but not in itself sufficient to justify the annexation of the two districts.

In the Central Himalaya (Nepal) only one species (*G. ovatum*) has been found; as this also occurs in Sikkim, the Central Himalaya must be united with the Eastern Himalaya. In the Eastern Himalaya besides *G. ovatum* two other forms (*G. parviflorum* var. *farinosa* and *G. lucidum* var. *canescens*) occur; but as all three extend eastward across the Brahmaputra and occur in the Assam range of hills, the Himalayan districts must, so far as this genus is concerned, be annexed to Assam.

In Assam itself, limiting the term to the mountain ranges that run from north-east to south-west between the Brahmaputra and Upper Burma, fourteen forms have been found. These include all the species that occur in the Himalaya, and all but two of the species that occur in Burma; six of them are endemic. As indicating the central position of this range so far as forms of *Gomphostemma* are concerned, it may be noticed of two species (*G. parviflorum* and *G. lucidum*) that two very distinct varieties of each occur in the district, these varieties being severally distributed; *G. parviflorum* var. *farinosa* occurs both in the Eastern Himalaya and in the Khasia hills, but does not extend to Burma, while *G. parviflorum* var. *typica* extends from the Khasia hills to Manipur, Lushai, Chittagong,

Arracan, Pegu, and Siam, but does not occur in the Himalaya; *G. lucidum* var. *typica* extends from Silhet to the Jaintea hills, Upper Burma, and Yunnan, but does not cross the Brahmaputra, while *G. lucidum* var. *canescens* occurs in the Eastern Himalaya and the Mishmi and Eastern Naga hills, but does not extend to Burma or Yunnan. As showing further the validity of the annexation of the Himalaya to the district, it should be noted that the two forms of *G. ovatum* that occur in Sikkim both appear in it; var. *typica* extends from Nepal to Upper Assam, while var. *flaccida*, which apparently does not occur in Nepal or in *Upper* Assam, reappears both in the Jaintea and in the Khasia hills. Of the six "endemic" forms it should be noted that *G. Thomsoni* is hardly separable from typical *G. crinitum*, and certainly cannot be kept apart for phytogeographical purposes; that *G. pedunculatum* has a very distinct, but still a representative species (*G. Curtisii*) in the Malay peninsula; that *G. Mastersii* is (perhaps) the representative in the district of the quite distinct, but still nearly related, Eastern Chinese *G. chinense*. The three remaining endemic species (*G. niveum*, *G. velutinum*, and *G. melissifolium*) are however very distinct and well-defined. The subjoined table shows the distribution of these Assam species:—

TABLE VII.—*Table of distribution for the* Assam Range.

NAME OF SPECIES.	Endemic.	To Himalaya.		To Burma, including Siam and Yunnan.	
G. Wallichii	...	...		1	
G. nutans	...	...	...	1	$\frac{2}{3}$
G. parviflorum (2 vars.)	...	$\frac{1}{2}$		$\frac{1}{2}$	
G. crinitum (1 var.) ...	...	...	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{2}$
G. Thomsoni	1	...		...	
G. lucidum (2 vars.)	...	... $\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$
G. pedunculatum	1	$\frac{1}{2}$ ...	...	...	...
G. niveum	1	1 ...	...	...	...
G. ovatum (2 vars.)	...	... 1	1	...	...
G. Mastersii	1	1 ...	...	...	...
G. velutinum	1	1 ...	...	...	...
G. melissifolium	1	1 ...	...	...	...
Totals of artificial species ...	6	2		$3\frac{1}{2}$	
Percentages of ditto	52·1%	17·4%		30·4	
Totals from probable natural species ...		$4\frac{1}{2}$		$1\frac{1}{2}$	$1\frac{5}{12}$
Percentages from ditto ...		60·6%		20·2	19·1%

The degree of isolation indicated by the endemic percentage seems in this case quite sufficient to justify us in looking on Assam as *à priori* a distinct phytogeographical district; and as in this case again the amount of connection with Burma is decreased instead of increased when approximately natural units are employed in computing it, it becomes necessary to look upon the two as separate.

In the Andaman islands only one species (*G. oblongum*) has been found. As this occurs in precisely the same form in Tenasserim, the Andaman group, so far as this genus is concerned, has to be annexed to that district. In the Martaban-Tenasserim district itself—the district of the Malay Isthmus—four other forms have been found. These are *G. strobilinum* var. *viridis*, which is not specifically, and is perhaps hardly varietally, different from the Arracan *G. strobilinum* var. *acaulis*; *G. crinitum* var. *typica*, which extends to Burma and Assam on the one hand and to the Malay peninsula on the other; *G. Scortechinii* var.? *Helferi*, a plant that is apparently a variety of a Peninsular species, and *G. rugosum*, a species that also appears in Java. The subjoined table gives the distribution of these Tenasserim-Andaman species:—

TABLE VIII.—*Table of distribution for* Tenasserim-Andamans.

NAME OF SPECIES.	Endemic.	To Burma.	To Malay Peninsula and Archipelago.
G. oblongum	1	...	...
G. Scortechinii (1 var.) ...	$\frac{1}{2}$	...	...
G. rugosum	...	...	1
G. strobilinum (1 var.)	$\frac{1}{3}$	...	...
G. crinitum (1 var.)	...	$\frac{1}{2}$	$\frac{1}{2}$
Totals of artificial species ...	$1\frac{5}{6}$	$\frac{1}{2}$	$1\frac{1}{2}$
Percentages of ditto ...	55%	15%	45%
Totals from probable natural species ...	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{5}{12}$
Percentages from ditto ...	40%	30%	50%

In this case the degree of isolation indicated by the endemic percentage is somewhat decreased when approximately natural units are used in computing it. This prevents our feeling justified in considering the district phytogeographically distinct; as the same process increases both the Burmese and the Malayan percentages, causing the latter to exceed the endemic percentage, the annexation of the district to Malaya is strongly suggested.

From the Philippines one form has been reported (*G. Philippinarum*); this is endemic in the group, but for phytogeographical purposes it cannot be separated from the Andaman-Tenasserim *G. oblongum*. Though it is therefore necessary to look upon the Philippines as forming a separate district, this must be considered merely a tentative measure. From Borneo no species has as yet been reported, and the same is true of Sumatra, but from the Malay Peninsula five forms have been obtained. These are *G. microcalyx*, endemic and morphologically distinct; *G. Curtisii*, also endemic and distinct, but apparently the representative here of the Assam *G. pedunculatum*; *G. Scortechinii* var. *typica*, also endemic, but rather a local manifestation of the protean *G. oblongum* than a distinct species; *G. crinitum* var. *typica*, extending to Tenasserim, Burma, and Assam; and *G. crinitum* var. *Griffithii*, which is endemic.

The subjoined table shows the distribution of these Peninsular species:—

TABLE IX.—*Table of distribution for the* Malay Peninsula.

NAME OF SPECIES.	Endemic.		To Tenasserim.	
G. microcalyx	1	1	...	...
G. crinitum (2 vars.)	½	¼	½	¼
G. Curtisii	1	½	...	...
G. Scortechinii (var.)	½	¼	...	...
Totals of artificial species ...	3		½	
Percentages of ditto ...	85·7%		14·2%	
Totals from probable natural species	1+½		¼	
Percentages from ditto	88·4		11·5	

The degree of isolation indicated by the endemic percentages is so great that we are justified in considering the district phytogeographically distinct, more particularly since it is found that a union of this district with the only one to which its species are known to be distributed, while increasing the total number of species, would decrease the endemic percentage for the conjoint area from 85·7% to 76·3% if calculated from the artificial species, and from 88·4% to 76·4% if calculated from probable natural units.

From the island of Java five forms have been reported. These are *G. phlomoides*, morphologically very distinct, and though extending to the island of Madura not reported from any other part of the Malay archipelago; "*G. flavescens*" (Anthocoma flavescens *Zoll.*), also endemic, but only doubtfully to be referred to the genus; "*G. dichotomum*," which is almost certainly the same as typical *G. parviflorum*, and which certainly

cannot for phytogeographical purposes be separated from that species; *G. rugosum*, which occurs in the same form in Tenasserim; and *G. javanicum*, which, though endemic, cannot for phytogeographical purposes be separated from *G. oblongum*, a plant that extends in various local manifestations to the Malay Peninsula and Isthmus, to the Andamans, and to the Philippines. The subjoined table gives the distribution of these Java species:—

TABLE X.—*Table of distribution for* Java (*including* Madura).

NAME OF SPECIES.	Endemic.		To Tenasserim.	
G. phlomoides	1	1	...	...
(G. flavescens)	1	1	...	...
G. parviflorum (1 var.)	...	...	$\frac{1}{2}$	$\frac{1}{4}$
G. rugosum	...	...	1	$\frac{1}{4}$
G. javanicum	1	$\frac{1}{4}$	...	...
Totals of artificial species ...	3		$1\frac{1}{2}$	
Percentages of ditto ...	66·6%		33·3%	
Totals from probable natural species		$2\frac{1}{4}$		$\frac{1}{2}$
Percentages from ditto		75%		16·6

From the degree of isolation indicated by the endemic percentage in this case, we must look upon Java and Madura as constituting a separate phytogeographic district.

Southern India has yielded two species (*G. Heyneanum* and *G. eriocarpon*); both are morphologically very distinct and both are endemic, so that, like Eastern China, Southern India must be looked upon as constituting a distinct phytogeographical district.

The following table shows more compactly the various districts that are delimited by this genus, with the number and endemic percentage of the species reported from each:—

TABLE XI.—*Districts of* S. E. Asia *indicated by the genus* GOMPHOSTEMMA.

NAME.	Political components.	Number of species.	Percentage endemic.	Number of natural units.	Percentage endemic.
1. S. E. China ...	Kwangtung, Fokien, Hainan.	1	100·0	1	100·0
2. Burma ...	Siam, Shan Plateau, Pegu, Arracan, Upper Burma, S. W. Yunnan.	7	32·2	4	46·8
3. Assam ...	Assam ranges, Brahmaputra valley, Eastern and Central Himalaya.	12	52·1	9	60·6
4. Malay Isthmus ...	Martaban, Tavoy, Tenasserim; Andamans.	5	55·0	3	40·0
5. Malay Peninsula ...	Perak, Penang, Malacca, etc.	4	85·7	4	88·4
6. Malay Archipelago...	Java, Madura ...	5	66·6	4	75·0
7. Philippines ...	Philippine Islands ...	1	100·0	...	...
8. S. India ...	Deccan, Carnatic ...	2	100·0	2	100·0

By adding together such of these districts as give a markedly increased endemic percentage for the conjoined area, we obtain an approximation to the natural phytogeographical *divisions* of the area inhabited by the genus. There is no difficulty with any of the districts except that of the Malay Isthmus (Tenasserim and the Andamans). By adding together Assam and Burma, we obtain an area yielding 14 artificial species or 10 natural units with endemic percentages respectively of 92·4% and 94·5%. If to this conjoint area we proceed to add Tenasserim, we obtain totals of 17 and 15 respectively, but reduce the corresponding endemic percentages to 84·3% and 90%, results which are clearly less natural than those obtained excluding Tenasserim from Indo-China. If, on the other hand, we add Tenasserim to the rest of the Malayan districts, we obtain totals of 12 and 7 respectively, with endemic percentages of 90·7% and 90·6%; whereas if we exclude Tenasserim from Malaya, we reduce the Malayan totals to 10 and 6, with respective endemic percentages of only 77·7% and 85%, obviously less natural results than those obtained by annexing Tenasserim to Malaya.

The subjoined table shows the various divisions delimited by the genus, with the districts composing each :—

TABLE XII.—*Divisions of* S. E. Asia *indicated by the genus* GOMPHOSTEMMA.

DIVISION.	Districts.	Number of species.	Percentage endemic.	Number of natural units.	Percentage endemic.
I. CHINA ...	1. S. E. China ...	1	100%	1	100%
II. INDO-CHINA ...	2. Burma; 3. Assam	14	92·4%	10	94·5%
III. MALAYA ...	4. Malay Isthmus; 5. Malay Peninsula; 6. Malay Archipelago; 7. Philippines.	12	90·7%	7	90·6%
IV. INDIA ...	8. South Indian Peninsula.	2	100%	2	100%

CHAPTER II.—CONSPECTUS SPECIERUM.

GOMPHOSTEMMA Wallich.

Calyx campanulatus 10-nervis æqualis 5-dentatus extus sæpe costatus. *Corollæ* tubus basi tenuis sæpissime exsertus superne in faucem sæpius amplam inflatus intus sæpissime glaber et semper exannulatus, limbus 2-labiatus labio postico erecto fornicato integro vel emarginato antico patente late 3-fido. *Stamina* 4, pubescentia anticis longioribus sub galea ascendentia; antheræ per paria approximatæ 2-loculares loculis parallelis transversis nudis. *Discus* subæqualis vel postice in glandulam tumens. *Ovarium* glabrum vel rarius pubescens 4-partitum, stylus glaber vel rarissime apice pilis divergentibus ornatus stigmate 2-fido lobis subulatis postico parum breviore; *nuculæ* obovoideæ ovoideæ vel rarissime globosæ siccitate rugosulæ, glabræ vel hirsutæ areolâ latiusculâ parum oblique affixæ pericarpio crassiusculo carnoso vel fere suberoso nonnunquam colorato; *semina* normalia testa crassiuscula cotyledonibus plus minus inæqualibus.

Herbæ suffruticesve caulibus erectis vel decumbentibus humilibus vel elatis elongatisve sæpissime simplicibus subscabris vel indumento stellato tomentosis. *Folia* opposita ampla sæpe rugosa dentata vel integra, floralia conformia vel summa ad bracteas reducta, subtus indumento stellato plus minus tomentosa supra pilis strictis raro stellatis hispido-pubescentia rarius glabra. *Verticillastri* 6—24-flori, nunc sessiles et densi nunc pedunculati et cymis utrinque evolutis laxi, sæpissime axillares remoti in axillis foliorum inferiorum vel secus caulem aphyllum dispositi, nonnunquam in spicam densem bracteatam terminalem conferti; *bracteolæ* lanceolatæ vel lineares sæpius calyce breviores; *flores* majusculi sæpius sessiles corollis sæpius flavis extus fere semper stellato-pubescentibus, calycibus sæpe costatis extus stellato-tomentosis intus sæpissime pilis strictis hispidis viridibus raro bracteisque rubidis vel purpurascentibus.

§ Pogosiphon :—Corollæ tubo incurvo intus hirsuto, parte æquali calycem nec excedente, limbo latiusculo, labiis minoribus, nuculis 2-3.

* Strobilina :— *Verticillastris in spicam terminalem congestis, calyce intus tubo glabro dentibus hirsuto, nuculis ovato-oblongis glabris rugosis.*

a. Corolla lutea (raro punicea) calyce multo longiore :—

herbæ robustæ spicis erectis :—

bracteis cordatis spicis interruptis . . . 1. *G. Wallichii.*

bracteis cuneatis spicis continuis . . . . 2. *G. strobilinum.*

herbæ graciles spicis nutantibus . . . . . 3. *G. nutans.*

b. Corolla purpurascente calycem vix excedente . 4. *G. Heyneanum.*

** Hemsleyanum :— *Verticillastris remotis axillaribus, calyce intus tubo dentibusque hirsuto, nuculis late oblongis glabris rugosulis.*

c. Corolla calycem vix excedente, verticillastris densis, *tomento brevissimo denso cinereo* . . . 5. *G. Hemsleyanum.*

[*** Anthocoma :— *Verticillastris remotis axillaribus, calyce intus tubo (dentibusque) glabro, nuculis oblongis hirsutis (sublævibus).*

—. Corolla calycem vix excedente, verticillastris laxis cymosis . . . . . —. *G. flavescens.*]

§§ Stenostoma :—Corollæ tubo recto intus glabro, parte æquali calyce longiore, limbo angusto, labiis parvulis, nuculis solitariis lævibus.

* Niveum ; *calyce haud costato intus tubo dentibusque hirsuto, ovario glabro, nuculis oblongis apice obtusis glabris.*

d. tomento perbrevi densissimo albo, foliis sessilibus supra glaberrimis . . . . . 6. *G. niveum.*

** Parviflora ; *calyce parum costato intus tubo dentibusque hispidulo, ovario glabro, nuculis ovoideis apice angustatis glabris.*

e. corollæ tubo fauce vix inflato, calycis dentibus brevissimis . . . . . 7. *G. microcalyx.*

f. corollæ tubo fauce distincte inflato, calycis dentibus elongatis :—

verticillastris densis axillaribus et secus caulem aphyllum dispositis . . . . . 8. *G. Thomsoni.*

verticillastris laxis omnibus axillaribus cymis multifloris evolutis :—

bracteis omnibus latiusculis calyce longioribus, tubo calycis dentibus æquilongo vel longiore, tomento densiore albescente . . . . . 9. *G. parviflorum.*

bracteis (exterioribus exceptis) angustis calyce brevioribus, tubo calycis dentibus brevioribus, tomento laxo cinerascente. 10. *G. crinitum.*

*** Eriocarpon; *calyce parum costato intus tubo dentibusque glabro, ovario pubescente, nuculis globosis hirsutis.*

g. foliis petiolatis supra glabrescentibus . . . . 11. *G. eriocarpon.*

§§§ Eugomphostemma:—Corollæ tubo incurvo intus glabro, parte æquali calyce longiore, limbo amplo, labiis majusculis, nuculis late ovatis 4.

* Lucida; *calyce prominenter costato intus tubo dentibusque hirsuto, ovario dense villoso, nuculis lævibus.*

h. corollæ tubo calyce multo longiore:—
calycis dentibus acuminatis, nuculis maturis hirsutis:—
foliis majusculis haud rugosis breve petiolatis:—
stylo hirsuto:—
calyce tubo dentibus longiore . . . 12. *G. Philippinarum.*
calyce tubo dentibus breviore . . . 13. *G. Scortechinii.*
stylo glabro . . . . . 14. *G. oblongum.*
foliis minoribus longius petiolatis:—
styli lobis elongatis recurvis, *foliis haud rugosis* . . . . . 15. *G. javanicum.*
styli lobis brevibus, *foliis rugosissimis* . 16. *G. rugosum.*
calycis dentibus brevibus triangulis, nuculis maturis glaberrimis . . . . . 17. *G. lucidum.*
j. corollæ tubo calycem parum excedente . . . . 18. *G. phlomoides.*

** Pedunculata; *calyce haud costato intus tubo glabro dentibus parce hirsuto, ovario glabro, nuculis punctulatis;* cymis laxis.

k. corollæ tubo calyce parum longiore, bracteis floribusque alternis:—
bracteis obtusis serratis, calycis dentibus late triangulis tubo brevioribus . . . . . 19. *G. pedunculatum.*
bracteis acutis integris, calycis dentibus lanceolatis tubo longioribus . . . . . 20. *G. Curtisii.*
l. corollæ tubo calyce multo longiore, bracteis floribusque oppositis . . . . . 21. *G. chinense.*

*** Melissifolia; *calyce parum costato intus tubo dentibusque hirsuto, ovario glabro, nuculis lævibus.*

Bracteis calycem haud excedentibus, *foliis supra pilis stellatis hirsutis*, corollæ labio postico integro:—
m. bracteis exterioribus obtusis, calycis tubo dentibus multo beviore, corollæ tubo calyce multo longiore, foliis subtus (nervis exceptis) glabrescentibus, verticillastris (nonnunquam cymis evolutis) multifloris . . . . . 22. *G. Mastersii.*
n. bracteis omnibus acutis, calycis tubo dentibus æquilongo, corollæ tubo calyce paulo longiore, *foliis utrinque dense velutinis*, verticillastris paucifloris . . . . . 23. *G. velutinum.*

Bracteis exterioribus calyce longioribus, corollæ tubo calyce multo longiore :—

o. bracteis exterioribus ovatis obtusis, calycis dentibus tubo brevioribus, corollæ labio postico integro foliis majusculis obtusis *supra pilis strictis hirsutis*, verticillastris multifloris . . . . . 24. *G. ovatum.*

p. bracteis exterioribus oblongis acutis, calycis dentibus tubo æquilongis, corollæ labio postico emarginato, foliis minoribus acutis *supra glaberrimis*, verticillastris paucifloris . . . . . 25. *G. melissifolium.*

[The *letters* to the left indicate the probable limits of the *natural species* existing in the genus.]

CHAPTER III.—DESCRIPTIONS OF SPECIES.

Gomphostemma Wall. (1828).

Calyce æquali 5-dentato campanulato extus tomentoso, *corollæ* tubo basi tenui superne in faucem amplam dilatato, labio postico fornicato antico patente 3-lobo, *filamentis* pubescentibus, antherarum loculis parallelis transversis nudis, *ovario* 4-partito, stylo apice 2-fido, *nuculis* areola latiuscula parum oblique affixis, pericarpio crassiusculo, *cotyledonibus* inæqualibus.

§ Pogosiphon Prain (1890); corollæ tubo intus hirsuto, parte æquali calyce breviore, limbo latiusculo labiis minoribus, nuculis 2-3.

I. Strobilina; *verticillastris in spicam terminalem congestis, calyce nec costato intus tubo glabro dentibus hirsuto, ovario glabro, nuculis ovato-oblongis.*

1. Gomphostemma Wallichii *Prain* (1890).

Elata erecta caule robusto vix sulcato, *foliis* rigide rugosis petiolatis basi truncatis vel subcordatis ovatis apice acutis margine serratis, supra hispidis subtus petiolis caulibusque dense floccoso-tomentosis, *spica* erecta plus minus interrupta, *bracteis* sessilibus basi late cordato-ovatis margine regulariter serratis, sursum decrescentibus, calycem superantibus, *calycis* pallide viridis tubo dentibus longiore, *corolla* sulphurea alba vel raro punicea calyce 3-plo longiore, apice parum incurva, tubo medio intus antice hirsuto, labio postico extus parce puberulo corolla ceterum glabrescente, *stylo* glabro, *nuculis* nigris rugosis glabris.—G. strobilinum var. elatius *Benth. in Wall. Cat.* n. 2151/2 (1828) et *Pl. As. Rar.* ii, 12 (1831).—G. strobilinum *Benth., Lab. Gen. et Sp.* 617, *in parte* (1835) et *DC. Prodr.* xii, 550, *in parte* (1848); *Walp., Rep.* iii, 890, *in parte* (1845); *Miq., Flor. Ind. Bat.* ii, 989, *in parte* (1856); *Clarke, Jour. Linn. Soc.* xxv, 68 (1889); *nec Wall.*—G. strobilinum var. typica *Hook. f., Flor. Brit. Ind.* iv, 696, *in parte* (1885); *nec Wall.*—G. elatius *Wall. in sched. in Herb. Calcutt. servat.!*

In Assam superiore; in collibus Naga apud Kohima, 4,500 p. s. m. et prope Phesama, 4,000 p. s. m., *Clarke, Prain!* In Burma superiore; in collibus Taong-doung, *Wallich* n. 2151/2! in Karenee, *O'Riley!* in collibus Shan apud Pwehla, *Collett!* apud Maymyo, 4,000 p. s. m., *Kingii mercenar.!* prope Kendat, *Prazer!* In Yunnan occidentali, *Anderson!*

Caulibus 200—250 cm. altis obtuse tetragonis, petiolis 1—2 cm. longis, laminis 11—14 cm. longis his 7—9 cm. latis basi abrupte truncatis, bracteis inferioribus 40 mm. longis his 20 mm. latis, reliquis sursum decrescentibus 18—12 mm. longis his 14—9 mm. latis, bracteolis lanceolatis 6—10 mm. longis, *calyce* 11 mm. longo hoc 5 mm. lato—tubo calycis 6 mm. longo, dentibus 5 mm. longis his basi 3 mm. latis, *corollæ* tubo 22 mm. longo—parte tubi æquali 10 mm. longa, limbo 8 mm. lato, labio postico 9 mm. longo hoc 8 mm. lato, labio antico 8 mm. longo hoc 16 mm. lato, *nuculis* maturis 5 mm. longis his 3 mm. latis.

PLATE 75. Gomphostemma Wallichii *Prain*. Specimen from Maymyo, Upper Burma; *King's Collector*.

This species resembles *G. Heyneanum*, but is at once distinguished by its much larger corollas, its different bracts, and its interrupted spike. Its nearest *ally* is however *G. nutans*, which has the same calyx, and, except for its slightly denser tomentum, the same corolla. From *G. nutans* the large broad-based bracts, the long erect interrupted spikes, and the stout stems distinguish it. It is much less like *G. strobilinum*, with which it has since 1835 been associated. That species differs in tomentum, has much larger leaves which taper to the base, a calyx softly tomentose with long hairs, a shorter corolla and smaller bracts which are cuneate at the base, and subequal along the spike.

In 1821, as is shown by a manuscript note in *Herb. Calcutt.*, Dr. Wallich considered the plant entitled to specific rank. In 1828 (*Lith. Cat.* n. 2151/2) it was issued, in deference to Mr. Bentham's judgment, as a variety of *G. strobilinum*, and in 1831 (*Pl. As. Rar.* ii, 12) Mr. Bentham continued this treatment. But in 1835 (*Lab. Gen. et Sp.* 647), though no further examples are quoted, it was unconditionally reduced to *G. strobilinum*, a treatment which has been followed in all subsequent works. Numerous examples of both plants have been communicated since the Wallichian distribution, and these show that Dr. Wallich's original opinion was just; in order, however, to avoid the inconvenience of issuing a name that did not originally find acceptance, the species has been re-named and dedicated to that botanist.

One circumstance in connection with this species has to be mentioned. This, which corresponds to n. 2151/2 of the Wallichian catalogue, has been more frequently collected and distributed than the plant which corresponds with *Cat.* n. 2151/1. The name "*G. strobilinum*" having been applied to both has thus become more associated with this species than with the plant to which that name really belongs and to which it has in this paper been limited.

2. Gomphostemma strobilinum *Wall.* (1828).

Elata vel humilis caule robusto sulcato scabro, *foliis* subsessilibus vel breve petiolatis basi attenuatis elliptico-ovatis apice acutis margine serratis supra hispidis subtus petiolisque tomentosis vel glabrescentibus, *spica* erecta basi tantum interrupta, *bracteis* supparibus ovato-lanceolatis calycem viridem superantibus basi cuneatim attenuatis, *calycis* tubo dentibus longiore, *corolla* flava calyce 2-plo longiore parum incurva, tubo medio intus antice hirsuto, labio postico extus parce vestito corolla ceterum glabrescente, *stylo* glabro, *nuculis* brunneis rugosis glabris.

VAR. *typica;* elatior caule profunde sulcato, bracteis apice acutis antice irregulariter dentatis basi integris, foliis rugosis subtus tomentosis.—G. strobilinum *Wall.*, *Cat.* n. 2151/1 (1828); *Benth.*, *Wall. Pl. As. Rar.* ii., 12 (1831), *Lab. Gen. et Sp.* 647, *in parte* (1835) et *DC. Prodr.* xii, 550, *in parte* (1848); *Walp.*, *Rep.* iii, 896, *in parte* (1845); *Miq.*, *Flor. Ind. Bat.* ii, 989 (1856).—G. strobilinum VAR. typica *Hook. f.*, *Flor. Brit. Ind.* iv, 696, *in parte* (1885).

In BURMA; Meaong, ad ripas fl. Irrawady, *Wallich* n. 2151/1! Pegu in Yomah, *Kurz* nn. 597! 2412! 2413! apud Mingin, *Prazer!*

VAR. *viridis;* humilior caule distincte sulcato, bracteis acutis antice basique integris, foliis haud rugosis subtus nervis parce puberulis ceterum glabris.—G. strobilinum VAR. viridis *Hook. f., Flor. Brit. Ind.* iv, 696 (1885).—G. viride?, "G. strobilino valde affine" *Wall., Cat.* n. 2153 (1828).—G. viride *Wall.* ex *Benth., Wall. Pl. As. Rar.* ii, 12 (1831), *Lab. Gen. et Sp.* 647 (1835) et *DC. Prodr.* xii, 550 (1848); *Walp., Rep.* iii, 896 (1845); *Miq., Flor. Ind. Bat.* ii, 989 (1856).

In BURMA inferiore; Tavoy, *Gomez* (*Wall., Cat.* n. 2153)! Pegu, *Kurz* n. 595!

VAR. *acaulis;* humilis caule indistincte sulcato, bracteis apice acutis vel obtusis antice regulariter dentatis basi integris, foliis subrugosis subtus tomentosis, verticillastris imis nonnunquam plus minus laxis subcymosim evolutis.—G. acaule *Kurz* ex *Hook. f., Flor. Brit. Ind.* iv, 696 (1885).

In BURMA inferiore; Arracan, in colle Mingoo in Boronga ins., in sylvis, *Kurz* (bis)!

Caulibus VAR. *typicæ* 40—130 cm. VAR. *viridis* 7—25 cm. VAR. *acaulis* 3—12 cm. altis crassioribus obtuse tetragonis, petiolis in VAR. *typica* 0—2 cm., in reliquis 3—6 cm. longis, basi sæpissime persensim sed in VAR. *acauli* nonnunquam abruptius attenuata, laminis 14—40 cm. longis his 9—14 cm. latis, bracteis omnibus 15—18 mm. longis his 20—22 mm. latis, bracteolis lineari-lanceolatis 6—8 mm. longis, *calyce* 11 mm. longo hoc 5 mm. lato—tubo calycis 6 mm. longo, dentibus 5 mm. longis his basi 3 mm. latis, *corollæ* tubo 14 mm. longo—parte tubi æquali 10 mm. longa, limbo 7 mm. lato, labio postico 8 mm. longo hoc 8 mm. lato, labio antico 7 mm. longo hoc 13 mm. lato, *nuculis* maturis 5 mm. longis his 3 mm. latis.

PLATE 76. Gomphostemma strobilinum *Wall.* VAR. typica. Specimen from Pegu, *Kurz* n. 2142.

PLATE 77. G. strobilinum *Wall.* VAR. viridis *Hook. f. Wallichian Herbarium* n. 2153 at Calcutta.

PLATE 78. G. strobilinum *Wall.* VAR. acaulis *Prain.* Specimens of same gathering from Boronga, *Kurz.*

The relationship of *G. strobilinum* VAR. *typica* to *G. Wallichii* has been discussed under that species. On the sheet of n. 2153 Dr. Wallich has written "*G. viride?*" while in the catalogue itself he has added the remark "*G. strobilino valde affine.*" Mr. Bentham in all his accounts has consistently given the plant specific rank, but makes his diagnosis largely depend on the character "corolla-tube shorter than in *G. strobilinum.*" The corolla-tube of VAR. *viridis* is indeed shorter than that of *G. Wallichii* (which Mr. Bentham included in *G. strobilinum*), but not than that of *G. strobilinum* proper. The character therefore fails, and the reduction effected by Sir Joseph Hooker (*Flor. Brit. Ind.* iv, 696) seems very just. The name given by Mr. Kurz to the third variety is somewhat unfortunate, only 3 specimens in the two large gatherings that represent it being stemless. Though at first sight it appears a distinct species, study of the extensive material at Calcutta convinces me that the plant might almost be considered a *state* of VAR. *viridis* rather than a separate variety. It is of interest as combining the dwarf habit, few-flowered spikes and petioled leaves of VAR. *viridis* with the harsher leaves, dentate bracts, and closer tomentum of VAR. *typica*, but it differs from both in having some of the bracts obtuse, and in having the lower whorls sometimes cymose, thus making the inflorescence thyrsoid instead of spicate.

3. Gomphostemma nutans *Hook. f.* (1885).

Elata ascendens caule gracili parum sulcato, *foliis* subsessilibus basi cuneatis ovatis apice acutis margine serratis, supra hispidis subtus petiolis caulibusque dense molliter tomentosis, *spica* brevi densa nutante, *bracteis* supparibus ovatis vel ovato-lanceolatis margine subintegris basi cuneatim attenuatis calycem superantibus, *calycis* viridis tubo dentibus longiore, *corolla* flava calyce 3-plo longiore apice antice parum incurva, tubo medio intus antice hirsuto extus æquabiliter tomentoso, *stylo* glabro, *nuculis* nigrescentibus rugosis glabris.—G. nutans *Hook. f., Flor. Brit. Ind.* iv, 697 (1885).

In Assam inferiore; in montibus Khasia, 2,000—3,000 p. s. m., *Lobb, Simons! Mann!* apud Nunklow, 3,500 p. s. m., *Clarke;* ad Nya Bungalow, 2,500 p. s. m., *Clarke* n. 40645! In Burma superiore; in collibus prope Kendat, *Prazer* n. 374!

Caulibus 30—90 cm. altis gracilibus subteretibus, petiolis 0—1 cm. longis, laminis 5—9 cm. longis his 2·5—4 cm. latis, bracteolis linearibus 4 mm. longis, *calyce* 13 mm. longo hoc 5 mm. lato—tubo calycis 6 mm. longo, dentibus 7 mm. longis his basi 3 mm. latis, *corollæ* tubo 26 mm. longo—parte tubi æquali 9·5 mm. longa, limbo 8·5 mm. lato, labio postico 7 mm. longo hoc 8 mm. lato, labio antico 10 mm. longo hoc 18 mm. lato, *nuculis* maturis 5 mm. longis his 3 mm. latis.

Plate 81. Gomphostemma nutans *Hook. f.* A—Specimen from Khasia, *Simons.* B—Also from Khasia, *Clarke* n. 40645.

A species diagnosed from all the other members of the *Strobilina* group by its short drooping or nodding spikes and its slender stems. Its nearest ally is *G. Wallichii*, from which it differs in leaves and bracts, but with which it quite agrees in calyx, corolla, and nutlets. The Kendat specimens closely resemble Cachar specimens of *G. melissifolium* in habit, having slender sprawling stems 6—9 feet in length which root at the nodes when they rest on the ground, but do not require to do so if they climb over adjacent bushes.

4. Gomphostemma Heyneanum *Wall.* (1828).

Elata erecta caule robusto sulcato, *foliis* elliptico-ovatis laminis basi abruptius in petiolum subalatum attenuatis, rugosis, supra molliter hirsutis subtus petiolisque dense floccoso-tomentosis, *spica* erecta basi tantum parum interrupta, *bracteis* supparibus ovatis vel ovato-lanceolatis calycem superantibus, *calycis* viridis tubo dentibus longiore, *corolla* purpurascente calycem æquante apice antice incurva, tubo medio intus antice hirsuto, labio postico brevi, parte tubi infundibuliformi labiisque (lobo labii antici medio excepto) dense tomentosa, *stylo* glabro, *nuculis* nigris rugosis glabris.

Var. *typica;* caulibus vix sulcatis dense tomentosis, foliorum laminis utrinque acuminatim attenuatis margine mere serratis, bracteis ovato-lanceolatis basi obtusis apice acutis.—G. Heyneanum *Wall., Cat.* n. 2152/1 (1828) et 2152/B (1829); *Benth. in Wall., Pl. As. Rar.* ii, 12 (1831), *Lab. Gen. et Sp.* 647 (1835) et *DC. Prodr.* xii, 551 (1848); *Walp., Rep.* iii, 896 (1845); *Wight, Ill. Ind. Bot.* 222, t. 176*b*, f. 9 (1850) et *Icones* iv, t. 1496 (1850).—G. strobilinum var. Heyneana *Hook. f., Flor. Brit. Ind.* iv, 696 (1885).—Stachys tomentosa *Heyne Mss., syn. ex Wall. in Cat.* n. 2152/1 (1828); *Benth. in Wall., Pl. As. Rar.* ii, 12 (1831).—S. indica *Wight Mss., syn. in Wall. Cat. quoad* n. 2152/B *tantum* (1829).

In India Australi; Courtallam, *Heyne*, *Perrottet*, *Wight!* in tractu Concan, *Stocks!* in collibus Anamallai, 4,000 p. s. m., *Gamble* n. 14628!

Var. *Rottleri;* caulibus distincte sulcatis subscabris, foliorum laminis apice obtusis margine crenato-serratis, bracteis ovatis basi cuneatis apice obtusis.—G. Heyneanum *Wall.*, *Cat.* n. 2152/C (1829).—Stachys indica *Wall., syn. in Cat. quoad* n. 2152/C, *vix Wight* (1829).—S. orientalis *Rottler Mss. in Herb. Madr.!*

In India Australi; Courtallam, *Rottler!* in collibus Mudumallai, 2,000 p. s. m., *Gamble* n. 17983!

Caulibus 60—100 cm. altis crassioribus obtuse tetragonis, petiolis 4 cm. longis, laminis 16—24 cm. longis his 10—15 cm. latis, bracteis inferioribus 25—35 mm. longis his 15—20 mm. latis, reliquis 15—10 mm. longis his 10—5 mm. latis, bracteolis linearibus 4 mm. longis, *calyce* 11 mm. longo hoc 5 mm. lato—tubo calycis 6 mm. longo, dentibus 5 mm. longis his basi 3 mm. latis, *corollæ* tubo 10 mm. longo—parte tubi æquali 6·5 mm. longa, limbo 6 mm. lato, labio postico 4 mm. longo hoc 7 mm. lato, labio antico 6 mm. longo hoc 11 mm. lato, *nuculis* maturis 5 mm. longis his 3 mm. latis.

Plate 79. Gomphostemma Heyneanum *Wall.* var. typica. Specimen from Anamallai hills, *Gamble* n. 14628.

Plate 80. G. Heyneanum *Wall.* var. Rottleri *Prain.* Specimens from Courtallam, *Rottler* (*Wall. Cat.* n. 2152/C).

The most distinct species of the *Strobilina* group; diagnosed from all the other members by its small blue-purple corolla. Its two varieties differ very considerably in stem and in foliage, but in both the calyx, corolla, and nutlets are precisely the same.

The separable forms constituting the group *Strobilina* are of very unequal rank, and possibly the next revision of the genus may demonstrate that it is sufficient to recognise within its limits only two species. These will probably be limited somewhat as follows:—

A. G. strobilinum *Wall. augm.;* corolla lutea, raro punicea calyce multo longiore.

Sub-sp. 1. genuina; herbæ robustæ spicis erectis.

Var. *a. elatius* Benth.; bracteis cordatis, spicis elongatis interruptis caulibus elongatis = G. strobilinum var. elatius *Benth.* in *Wall. Cat.* 2151/2 (G. Wallichii *Prain uti supra*).

Var. *β. typica;* bracteis cuneatis, spicis elongatis continuis, caulibus elongatis =G. strobilinum *Wall. Cat.* 2151/1.

Var. *γ. nana;* bracteis cuneatis, spicis brevioribus densis, caulibus brevibus = G. viride *Wall. Cat.* 2153 & G. acaule *Kurz* ex *Hook. f., Flor. Brit. Ind.* iv, 696.

Sub-sp. 2. nutans; herbæ graciles, spicis nutantibus brevioribus densis, bracteis cuneatis = G. nutans *Hook. f., Flor. Brit. Ind* iv, 697.

B. G. Heyneanum *Wall.;* corolla purpurascente calycem vix excedente = G. Heyneanum *Wall. Cat.* 2152.

In the meantime, however, in the absence of the necessary intermediate forms, it is impossible to formally propose these reductions.

II. Hemsleyanum; *verticillastris remotis axillaribus, calyce nec costato intus tubo dentibusque hirsuto, ovario glabro, nuculis late oblongis.*

5. Gomphostemma Hemsleyanum *Prain* (1890).

Elata erecta caule sulcato robusto, *foliis* rugosis petiolatis basi attenuatis, elliptico-ovatis acutis margine argute serratis, laminis supra parce hispidulis subtus petiolis caulibusque brevissime dense cinereo-tomentosis, *verticillastris* multifloris densis, *bracteis* lanceolatis linearibusve calyce brevioribus, *calycis* pallide viridis tubo dentibus multo breviore, *corolla* flava adunca extus hirsuta calyce vix longiore, tubo medio intus hirsuto, *nuculis* nigris rugosulis glabris, intus pallidis lucentibus.—G. Hemsleyanum *Prain Mss.* ex *Coll. et Hemsl.*, *Jour. Linn. Soc.* xxviii, 116 (1890).

In Burma superiore; apud Meiktila, *Collett* nn. 17! 887!

Caulibus plus quam 60 cm. altis tetragonis, petiolis 1—3 cm. longis, laminis basi abruptius attenuatis 10—18 cm. longis his 4—7 cm. latis, bracteis 14—25 mm. longis his 3—7 mm. latis, *calyce* 14 mm. longo hoc 5 mm. lato—tubo calycis 5 mm. longo, dentibus 9 mm. longis his basi 3 mm. latis triangularibus, *corollæ* tubo 10 mm. longo—parte tubi æquali 5 mm. longa, limbo 5 mm. lato, labio postico 3·5 mm. longo hoc 5·5 mm. lato, labio antico 8·5 mm. longo hoc 9·5 mm. lato, *nuculis* maturis (1—3) subglobosis 6 mm. longis his 5 mm. latis.

Plate 82. Gomphostemma Hemsleyanum *Prain*. Specimen from Meiktila, Upper Burma, *Collett* n. 887.

A very distinct species; agreeing with *Strobilina* in having the corolla tube hirsute within, but differing from these in general habit as to which it agrees with the rest of the genus. It most closely resembles *G. niveum* in foliage and tomentum, but its included, distinctly incurved, and internally hirsute corolla, its much larger calyx which has longer teeth, and its grey (in place of white) tomentum, amply distinguish it. The species is dedicated to Mr. W. B. Hemsley, but for whose kind assistance it would have been impossible for me to have prepared this account of the genus.

If *Gomphostemma flavescens* Miq., Flor. Ind. Bat. ii, 987 [1856] (*Anthocoma flavescens* Zoll., Nat. en Geneesk. Arch. ii, 569 [1846]) is truly referable to this genus, it must stand next to *G. Hemsleyanum*. The hirsute nutlets, however, indicate a hirsute ovary, and imply a relationship with *Lucida*, similar to that indicated by *Eriocarpon* among the Stenostomata. It would therefore be necessary to give it the rank of a group which might be defined as follows:—

II*b*. Anthocoma; *verticillastris remotis axillaribus, calyce intus glabro, ovario hirsuto, nuculis oblongis.*

But in the absence of authentic specimens it is impossible to localise this species definitely, and in view of the doubts as to the generic position of the plant (already fully discussed, p. 231, footnote) this must be looked on as a purely tentative definition.

§§ Stenostoma Prain (1890); corollæ tubo intus glabro, parte æquali calyce longiore, limbo angusto labiis parvulis, nuculis singulis.

III. Niveum; *verticillastris remotis axillaribus, calyce nec costato intus tubo dentibusque hirsuto, ovario glabro, nuculis oblongis.*

6. Gomphostemma niveum *Hook. f.* (1885).

Elata erecta caule robusto sulcato, *foliis* subsessilibus rugosissimis basi attenuatis elliptico-oblanceolatis acuminatis margine serratis, supra glaberrimis subtus petiolis caulibusque dense albo-tomentosis, *verticillastris* multifloris densis, *bracteis* ovatis lanceolatis linearibusve calycem angustiorem superantibus, *calycis* albo-tomentosi tubo dentibus longiore, *corolla* flava fere recta calyce vix 2-plo longiore, extus parce puberula, *stylo*

glabro, *nuculis* pallide brunneis glabris vix rugosulis.—G. niveum *Hook. f.*, *Flor. Brit. Ind.* iv, 697 (1885).—G. parviflorum *Herb. Ind. Or. H. f. et T.T.*, *nec Wall.*

In Assam superiore et inferiore; in montibus Mishmi, *Griffith;* in montibus Khasia, 3—4,000 p. s. m., *Hooker et Thomson! Mann!*

Caulibus crassis 80—120 cm. altis obtuse tetragonis, petiolis 0—2 cm. longis, laminis basi persensim attenuatis 15—40 cm. longis his 6—13 cm. latis, bracteis 9—22 mm. longis his 2—12 mm. latis, *calyce* 10 mm. longo hoc 3 mm. lato (calyce fructigero 4·5 mm. lato)—tubo calycis 6 mm. longo, dentibus 4 mm. longis his basi 2 mm. latis, *corollæ* tubo 16 mm. longo—parte tubi æquali 11 mm. longa, limbo 4 mm. lato, labio postico 4 mm. longo hoc 3·5 mm. lato, labio antico 5 mm. longo hoc 8·5 mm. lato *nuculis* sæpissime solitariis, nonnunquam tamen 2 vel 3, oblongo-ovatis 5 mm. longis his 2·75 mm. latis.

Plate 83. Gomphostemma niveum *Hook. f.* Specimen from Khasia, *Mann.*

A very distinct species; recognisable at once by its close short white tomentum.

IV. Parviflora; *verticillastris remotis axillaribus vel secus caulem aphyllum dispositis, calyce parum costato intus tubo dentibusque hispidulo, ovario glabro, nuculis ovoideis versus apicem angustatis.*

7. Gomphostemma microcalyx *Prain* (1890).

Elata erecta caule robusto sulcato, *foliis* petiolatis oblongo-ovatis acutis basi attenuatis margine integris vel minute late dentatis, supra hirsutis subtus nervis tantum vel æquabiliter tomentosis, petiolis caulibusque scabris, *verticillastris* paucifloris densis in axillis inferioribus et sæpissime secus caulem aphyllum tantum dispositis, *bracteis* ovato-lanceolatis integris calyce brevioribus, *calycis* viridis dentibus brevibus triangularibus tubo multo brevioribus, *corolla* aurantiaca fere recta calycem 4-plo excedente *fauce perangusta*, extus parce puberula, *stylo* glabro.

In peninsula Malayana; Perak, in Larut, 1,800—2,000 p. s. m., *Kunstler* n. 2155! *Scortechini* n. 842! *Wray* n. 835! in Ulu Bubong, *Kunstler* n. 10455!

Caulibus 60—150 cm. altis, petiolis (summis brevioribus exceptis) 4—5 cm. longis, laminis 12—15 cm. longis his 7—9 cm. latis, basi abruptius attenuatis, verticillastris sub-6-floris, bracteis 6—7 mm. longis his 2—3 mm. latis, *calyce* 7 mm. longo hoc 4 mm. lato—tubo calycis 5 mm. longo, dentibus 2 mm. longis his basi 2 mm. latis, *corollæ* tubo 26 mm. longo—parte tubi æquali 22 mm. longa, limbo 2·5 mm. lato, labio postico 4 mm. longo hoc 2 mm. lato, labio antico 7 mm. longo hoc 5·5 mm. lato, *nuculis* maturis ignotis, immaturis glabris lævibus.

Plate 84. Gomphostemma microcalyx *Prain.* Specimens from Larut, *Kunstler* n. 2155.

Mr. Hemsley has suggested that this may be only a starved form of *G. parviflorum.* But the suites of specimens at Calcutta are very large and very uniform, and the much smaller and shorter calyx with diminutive teeth, together with the much narrower-throated corolla, appear to make it very distinct from any of the other forms of the *Parviflora* group.

8. Gomphostemma Thomsoni *Benth.* (1885).

Elata erecta caule gracili subtereto, *foliis* petiolatis oblongo-ovatis acutis basi attenuatis margine crenulatis, supra hirsutis subtus petiolis caulibusque tomentosis,

verticillastris multifloris densis in axillis inferioribus et secus caulem aphyllum dispositis, *bracteis* lineari-lanceolatis integris calyce parum brevioribus, *calycis* viridis dentibus basi triangulari lineari-lanceolatis tubo longioribus, *corolla* sulphurea fere recta calycem 3-plo excedente, extus parce puberula, *stylo* glabro, *nuculis* brunneis glabris lævibus.—G. Thomsoni *Benth. Mss.* ex *Hook. f., Flor. Brit. Ind.* iv, 698 (1885).

In Assam inferiore; in montibus Khasia apud Cherrapunji, 3,500 p. s. m., *Hooker et Thomson !*

Caulibus 60—100 cm. altis, petiolis (summis brevioribus exceptis) 4—7 cm. longis, laminis 12—25 cm. longis his 7—12 cm. latis basi abruptius attenuatis, verticillastris sub-24-floris, bracteis 9—12 mm. longis sub-1 mm. latis, *calyce* 14 mm. longo hoc 4 mm. lato—tubo calycis 5 mm. longo, dentibus 9 mm. longis his basi 2 mm. latis, *corollæ* tubo 25 mm. longo—parte tubi æquali 19 mm. longa, limbo 3·5 mm. lato, labio postico 4 mm. longo hoc 3 mm. lato, labio antico 7 mm. longo hoc 7·5 mm. lato, *nuculis* maturis 6 mm. longis his 3 mm. latis.

Plate 85. Gomphostemma Thomsoni *Benth.* Specimens from Cherrapunji, *Hooker & Thomson.*

One specimen (fruiting) of the original gathering of this species in the Calcutta Herbarium has been figured. Another (in flower) has been very kindly communicated by the Director, Royal Gardens, Kew. The only characters wherein the plant differs from *Wall. Cat.* 2158/2 (the specimen marked "Gentea Mts." in the Wallichian Herbarium) are its condensed instead of lax whorls and the fact that some of the whorls in the fruiting specimen are on the stem below the leaves. There is so little doubt that these plants are conspecific that it is only the absence of a gathering *from this locality* showing both lax and dense whorls that has prevented the formal reduction being proposed. The probable true natural position of the plant is shown in the note at the end of the account of the group.

9. Gomphostemma parviflorum *Wall.* (1828).

Elata erecta caule robusto subtereto, *foliis* petiolatis rugosis elliptico-ovatis acutis basi attenuatis margine serratis, supra hirsutis subtus caulibus petiolisque laxe albo-tomentosis, *verticillastris* multifloris laxis utrinque cymis evolutis, rarissime densis, *bracteis* lanceolatis ovatisve calyce breve pedicellato longioribus, *calycis* dense albo-tomentosi dentibus lanceolatis tubo brevioribus, *corolla* flava fere recta calyce plus 2-plo longiore extus parce puberula, *stylo* glabro, *nuculis* brunneis glabris lævibus.

Var. *typica;* bracteis lanceolatis acutis, calycis dentibus lanceolatis tubo fere æquilongis.—G. parviflorum *Wall., Cat.* n. 2158/1 [*Herb. Heyne*] (1828) et n. 2158/E (1829); *Benth., Wall. Pl. As. Rar.* ii, 12, *in parte* (1831); *Hook. f., Flor. Brit. Ind.* iv, 697, *in parte* (1885).—G. dichotomum *Zoll. et Mor., Syst. Verzeichn.* 54 (1846); *Walp., Rep.* vi, 684 (1847); *Benth., DC. Prodr.* xii, 552 (1848); *Miq., Flor. Ind. Bat.* ii, 986 (1856).—G. multiflorum *Herb. Linn. Soc., quoad* Wall. Cat. nn. 2158/1 et 2158/E *vix* G. multiflorum *Benth.*

In Assam inferiore; in montibus Khasia, 4,000 p. s. m., *Hooker et Thomson ! Andersonii mercenar. ! Oldham ! Mann !* apud Mausmai, *Clarke* n. 16003! in collibus Manipur, 3—4,000 p. s. m. *Watt,* n. 7396! in collibus Lushai apud Lengti, *Prazer* (bis)! in collibus

Chittagong, apud Kasalong, *Clarke* n. 8241! et ad Kodala, *Kingii mercenar.* nn. 512! 564! In SIAM; *Finlayson.* In BURMA superiore; in collibus Tanglakon prope Kendat, 3,000 p. s. m., *Prazer!* In BURMA inferiore; Arracan, in Yomah, *Kurz!* In MALAYA; Java, prope Kiamis in sylvis, 3,200 p. s. m., *Zollinger.*

Speciminum typicorum a cel. *Wallich* ex "*Herb. Heyne*" sub *Cat. lith.* n. 2158/1 distributorum incerta manet sedes; vix tamen ex India Australi cum spp. *Heyneanis* plurimis neque, uti dicit ill. Bentham (*Lab. Gen. et Sp.*), ex Napalia recipi possint; forsan Birmannica.

VAR. *farinosa;* bracteis ovatis acutis vel obtusis, calycis dentibus triangularibus tubo manifeste brevioribus.—G. parviflorum *Wall. Cat.* n. 2158/2 *in parte* (1828) et n. 2158/D (1829); *Benth., Wall. Pl. As. Rar.* ii, 12, *in parte* (1831); *Hook. f., Flor. Brit. Ind.* iv, 697, *in parte* (1885).—G. multiflorum *Benth., Lab. Gen. et Sp.* 648 (1835) et *DC. Prodr.* xii, 552 (1848); *Walp., Rep.* iii, 897 (1845).—Leonurus farinosus *Ham. Mss.* ex *Wall., syn. in Cat. Lith.* [n. 2158/D] (1829).

In HIMALAYA orientali; Sikkim, 4,000 p. s. m., *Hooker!* Punkabari, 2,000 p. s. m., *T. Thomson! Kurz!* Nagree, 3,000 p. s. m., *T. Anderson!* Mungpoo, 3,000 p. s. m., *King!* ad ripas riv. Ryang, 2,000 p. s. m., *King!* in valle fl. Teesta, 1,000 p. s. m., *Clarke* n. 13674! apud Badamtan, 2,000 p. s. m., *Gamble!* In ASSAM inferiore; in collibus Mikir, *Jenkins!* in montibus Khasia, *Griffith* n. 241! *Mann!* apud Cherrapunji, 3,000 p. s. m., *Gallatly!* Silhet, *DeSilva* [Wall. Cat. n. 2158/2 in parte]! Goalpara, *Hamilton* [Wall. Cat. n. 2158/D] (bis)!

Caulibus 250—300 cm. altis crassis lignosis, petiolis 2—4 cm. longis, laminis 18—25 cm. longis his 7—10 cm. latis, verticillastris raro condensatis sæpissime cymis 4—5 cm. longis evolutis, bracteis 14—16 mm. longis his in VAR. *typica* 2—3 mm. latis in VAR. farinosa 7—10 mm. latis, pedicellis 1 mm. longis, *calyce* adpresse tomentoso 10—12 mm. longo hoc 4 mm. lato—tubo calycis 7 mm. longo, dentibus VAR. *typicæ* 5 mm. longis VAR. *farinosæ* 3 mm. longis his basi 2·5 mm. latis, *corollæ* tubo 20—22 mm. longo basi 2 mm. lato—parte tubi æquali 16—18 mm. longa, limbo 3·5 mm. lato, labio postico 5 mm. longo hoc 3·5 mm. lato, labio antico 6 mm. longo hoc 7 mm. lato, *nuculis* maturis 6 mm. longis his 3 mm. latis.

PLATE 86. Gomphostemma parviflorum *Wall.* VAR. typica. Specimen from Manipur, *Watt* n. 7396.

PLATE 87. G. parviflorum *Wall.* VAR. farinosa *Prain.* Specimens from Assam, *Wallichian Herbarium* nn. 2158/2 and 2158/D at Calcutta.

The synonymy of this species is somewhat involved, and the confusion extends to its nearest ally *G. crinitum*, in connection with which the question will be found fully discussed. The two varieties are ordinarily quite easily distinguished by their bracts, but intermediate forms are very common, and the specific rank (*G. multiflorum*) given by Bentham to VAR. *farinosa* cannot be sustained. In the Linn. Soc. Herbarium the *whole species* now stands as "G. multiflorum"; herbaria, therefore, which follow the arrangement adopted there know *G. parviflorum* Wall. (1828) as *G. multiflorum* Benth. (1835), and know as "G. parviflorum" another species. But Sir Joseph Hooker has pointed out (*Flor. Brit. Ind.* iv) that *G. multiflorum* Benth. is really *G. parviflorum* Wall., and has abandoned Mr. Bentham's specific name in favour of the true one. The typical variety sometimes much resembles typical *G. crinitum*, but a diagnosis is usually easily effected by means of the whiter tomentum, the shorter not subulate calyx teeth, and the different bracts.

10. **Gomphostemma crinitum** *Wall.* (1828).

Elata erecta caule parum sulcato, *foliis* petiolatis hand rugosis elliptico-ovatis acutis vel oblanceolatis basi attenuatis margine serratis integrisve, supra hirsutis subtus caulibus petiolisque cinereo-tomentosis, *verticillastris* multifloris sæpissime cymis laxis utrinque evolutis, nonnunquam densis, *bracteis* exterioribus lanceolatis reliquis linearibus calyce brevioribus, *calyce* laxe cinereo-pubescente vel glabrescente breve pedicellato, dentibus prælongis lineari-subulatis setaceo-hispidis tubum longe excedentibus, *corolla* flava fere recta calyce 2-plo longiore, extus parce puberula, *stylo* glabro, *nuculis* brunneis glabris lævibus.

VAR. *typica;* bracteis omnibus lanceolatis acutis linearibusve calycem fere æquantibus, foliis subito in petiolum longiorem alatum attenuatis laminis elliptico-ovatis subrugosis subtus densius tomentosis.—G. crinitum *Wall.*, *Cat.* n. 2159/1 (1828) et 2159/2 (1828 et 1829); *Benth.*, *Wall. Pl. As. Rar.* ii, 12 (1831), *Lab. Gen. et Sp.* 648 (1835) et *DC. Prodr.* xii, 552 (1848); *Walp.*, *Rep.* iii, 897 (1845); *Miq.*, *Flor. Ind. Bat.* ii, 987 (1856); *Hook. f.*, *Flor. Brit. Ind.* iv, 698, *in parte* (1885).—G. parviflorum *Wall.*, *Cat.* n. 2158/2 *in parte* (1828) et n. 2158/C [spp. eadem ac n. 2159/1 (1828) !] (1829) *haudquaquam* G. parviflorum *Wall.*, *Cat.* n. 2158/1; *Benth.*, *Wall. Pl. As. Rar.* ii, 12, *in parte* (1831); *Hook. f.*, *Flor. Brit. Ind.* iv, 697, *in parte* (1885).—G. parviflorum *Benth.*, *Lab. Gen. et Sp.* 648 (1835) et *DC. Prodr.* xii, 551 (1848); *Walp.*, *Rep.* iii, 897 (1845); *Miq.*, *Flor. Ind. Bat.* ii, 987 (1856) *nec* G. parviflorum *Wall.*

In ASSAM inferiore; Silhet, *DeSilva* (*Wall. Cat.* n. 2158/2 in parte)! In BURMA inferiore; Pegu, *Kurz* n. 596! Attaran, *Brandis!* Tavoy, *Gomez* (*Wall. Cat.* n. 2159/2)! In peninsula MALAYANA; Pulo Penang, *Wallich* (Cat. n. 2159/1 [1828], anno sequente infauste ad *G. parviflorum* [2158/C] relata)! Perak, apud Kampong Kota (bis), *Wray!* Sungei Ujong, *Ridleyi mercenar.* n. 1870!

VAR. *Griffithii;* bracteis exterioribus ovato-lanceolatis obtusis calyce distincte brevioribus, foliis sensim in petiolum perbrevem attenuatis laminis oblanceolatis membranaceis subtus molliter pubescentibus.—G. crinitum *Hook. f.*, *Flor. Brit. Ind.* iv, 698 (1885) *syn. Wall.* Cat. 2159 *exclus.*, *vix Wall.*

In peninsula MALAYANA; Malacca, in monte Ophir et in sylvis Chebu, *Griffith* n. 4042! Perak, in Gunong Ijok, *Scortechini* n. 5! apud Hulu Kwansa, *Scortechini* n. 928!

Caulibus 40—60 cm. altis, petiolis VAR. *typicæ* sub-4 cm. longis, VAR. *Griffithii* 1—2 cm. longis, laminis VAR. *typicæ* 25—30 cm. longis his 8—12 cm. latis, VAR. *Griffithii* 20—25 cm. longis his 6—8 cm. latis, pedicellis 1 mm. longis, *calyce* 17—20 mm. longo hoc 4 mm. lato, hispido-tomentoso vel brevissime puberulo—tubo calycis 5—7 mm. longo, dentibus VAR. *typicæ* 9—13 mm. longis VAR. *Griffithii* 10 mm. longis his basi 2·5 mm. latis, subito in acumen prælongum subulatum attenuatis, *corollæ* tubo 20—25 mm. longo—parte tubi æquali 16—20 mm. longa basi 2 mm. lata, limbo 3·5 mm. lato, labio postico 5 mm. longo hoc 3·5 mm. lato, labio antico 6 mm. longo hoc 7 mm. lato, *nuculis* 6 mm. longis his 3 mm. latis.

PLATE 88. Gomphostemma crinitum *Wall.* VAR. typica. Specimen from Perak, *Wray.*

PLATE 89. A—G. crinitum *Wall.* VAR. typica; *Wall. Cat.*, n. 2159/2, at Calcutta. B—G. crinitum *Wall.* VAR. Griffithii *Prain.* Specimen from Malacca, *Griffith.*

This species is very closely allied to *G. parviflorum*, but is easily recognised by its thinner leaves, ash-grey tomentum, smaller bracts and very long subulate calyx teeth. The Tavoy gathering (*Wall. Cat.* n. 2159/2) differs from n. 2159/1 (2158/C) in having only condensed whorls—a character of no importance, since in other gatherings dense and lax whorls occur in the same specimen, and in having glabrous calyces—a simple accident, the specimens being fruiting ones and the tomentum being deciduous in fruit; the gathering is not specifically distinct from 2159/1, which should not have been referred by Dr. Wallich to *G. parviflorum* unless he was prepared to suppress the species *G. crinitum* altogether. This is a course which has much to be said in its favour, but it is not followed here, mainly because of the necessity for uniform treatment throughout the genus; partly also because the diagnosis between *G. crinitum* and *G. parviflorum* is not very difficult, and because the writer has not as yet seen any good connecting specimens, even though the geographical areas of the two species overlap: moreover, the synonymy of the two species, which has become rather involved, is more easily disentangled if they be kept apart. The process is simplified by tabular presentation, and in TABLE XIII are given the names that the Wallichian specimens bear in the Lithographed Catalogue, and in Mr. Bentham's, in Sir Joseph Hooker's, and in the present treatise respectively. The information in column 5 has been very kindly supplied by Mr. Hemsley. The references of Dr. Walpers (1845) being a mere reprint of those of Mr. Bentham of 1835, and those of Dr. Miquel (1856) being an adaptation of those of Mr. Bentham of 1848, possess no intrinsic value, and are therefore omitted. The use of the name "G. multiflorum" in *Herb. Linn. Soc.* to designate typical *G. parviflorum* is evidently a change that has been made *since* 1848, for in that year (as in 1835, when he founded the species *G. multiflorum*,) Mr. Bentham only included in *G. multiflorum* specimens that belong to *G. parviflorum* VAR. *farinosa*; those that belong to *G. parviflorum* VAR. *typica* were left by him to serve, *in part*, as types of *G. parviflorum*, though he included in that species (as Dr. Wallich had previously done) two gatherings that belong to *G. crinitum*. It should further be noted that there is nothing in the description of *G. dichotomum* Zoll. et Mor. to separate that plant positively either from *G. parviflorum* or from *G. crinitum*. In the absence of specimens and for reasons detailed below, I have ventured tentatively to suggest its inclusion in *G. parviflorum*.

TABLE XIII.—*Synonymy of the Wallichian specimens of* Gomphostemma parviflorum *and* G. crinitum.

AUTHOR.	WALLICH.		BENTHAM.		—	HOOKER.	PRAIN.
Work.	*Lith. Cat. p.* 60.	*Lith Cat. p.* 92.	*Pl. As. Rar.* ii, 12.	*Lab. Gen. & Sp.* 648; *DC. Prodr.* xii, 551-2.	*Herb. Linn. Soc.*	*Flor. Brit. Ind.* iv, 607-8.	*Present paper.*
Date.	1828.	1829.	1831.	1835 & 1848.	Bet. 1848 & 1884.	1885.	1920
No.	1	2	3	4	5	6	7
1	2158/1: "*Herb. Heyne*:" G. parviflorum.	—	G. parviflorum.	G. parviflorum. ("*Napalia.*")	*G. multiflorum.* (Sheet 4.)	G. parviflorum.	G. parviflorum. VAR. typica.
2	2158/2: Sylhet; G. parviflorum.	—	G. parviflorum.	G. multiflorum. ("prov. Sillet.")	G. multiflorum. (Sheet 3 *a*.)	G. parviflorum.	G. parviflorum, VAR. farinosa.
3	2158/2: "Gentea Jits.;" G. parviflorum.	—	G. parviflorum.	G. parviflorum. ("Sillet.")	G. parviflorum. (Sheet 3 *β*.)	G. parviflorum.	G. crinitum, VAR. typica.
4	2159/1: Penang 1822; G. crinitum.	2158/C: Penang, 1822, re-edited; G. parviflorum.	G. parviflorum.	G. parviflorum. ("ins. Penang.")	G. parviflorum. (Sheet 1 *a*.)	G. parviflorum.	G. crinitum, VAR. typica.
5	2159/2: Tavoy, W. G.; G. crinitum.	—	G. crinitum.	G. crinitum. ("Tavoy.")	G. crinitum.	G. crinitum. (Tavoy, *Gomez*).	G. crinitum. VAR. typica.
6	—	2158/D: *Leonurus farinosus*, Goalpara, July and Oct. 1808; G. parviflorum.	G. parviflorum.	(G. multiflorum.) Not cited.	G. multiflorum. (Sheet 2, both gatherings).	G. parviflorum.	G. parviflorum. VAR. farinosa.
7	—	2158/E: "*Herb. Finlayson.*" G. parviflorum.	G. parviflorum.	(G. parviflorum.) Not cited.	*G. multiflorum.* (Sheet 1 *β*.)	G. parviflorum.	G. parviflorum, VAR. typica.

This table shows that in 1828 Dr. Wallich issued two gatherings of *G. parviflorum*, one belonging to Heyne's Herbarium and one obtained by his Collector, DeSilva, in Silhet. The former, being n. 2158/1 in the *Catalogue*, is of necessity the true type of *G. parviflorum*. Its exact locality, it ought to be observed, is unknown. If it had, like nearly all Heyne's other specimens, been collected in Southern India, it is extremely strange that it should never have been met with by subsequent collectors. And Mr. Bentham's opinion that it is from Nepal is undoubtedly unfounded; Wallich does not state that Heyne's plant came from Nepal, indeed Heyne had no means of obtaining Nepalese plants; Wallich does not himself appear to have obtained any form of *G. parviflorum* in Nepal, nor does he anywhere say that he did; finally, if any form of *G. parviflorum* is ultimately found in Nepal, it is reasonable to expect that it will be VAR. *farinosa* (Bentham's *G. multiflorum*) that will be met with there, since this is the only form that has hitherto been reported from Sikkim or the Eastern Himalaya. So far as is known, VAR. *typica* is confined to Indo-China—*to the east of* the river Brahmaputra; all the gatherings up to 1890 are from Lower Assam, Manipur, the Lushai hills, Chittagong, the Chindwin valley, Lower Burma, and Siam; as Heyne obtained plants from both the Indian peninsulas, it is almost certain that his plant came from some part of the area indicated above. The second gathering forms only part of Cat. n. 2158/2; it is the part marked "Sillet" in the type Herbarium and, though conspecific with n. 2158/1, it constitutes a distinct variety and is the same as 2158/D (*Leonurus farinosus* Ham. Mss.) described above as *G. parviflorum* VAR. *farinosa*. This is the plant that was by Mr. Bentham (1835) accorded specific rank under the name *G. multiflorum*. The remainder of Cat. n. 2158/2, marked in the type Herbarium "Gentea Mts.," agrees exactly with the plant issued as Cat. n. 2159/1 (1828).

In the same year (1828) Dr. Wallich issued two gatherings of *G. crinitum*, one collected by himself in Penang in 1822, the other obtained by his Collector, Gomez, in Tavoy. These were published as 2159/1 and 2159/2 respectively. But in 1829 Dr. Wallich had noticed that n. 2159/1 was the same as the "Gentea Mts." portion of his n. 2158/2. He therefore re-issued it in that year (as he explains in *Lith. Cat.* p. 92) as *G. parviflorum* Cat. n. 2158/C. So that in 1829 only 2159/2 was left as the type of *G. crinitum*. But 2159/2 differs from 2159/1 (converted into 2158/C) only in having condensed whorls—a character of no value—and in having glabrous calyces—an accident and not a character at all—and the two are certainly conspecific. If, therefore, Dr. Wallich rightly referred 2159/1 to *G. parviflorum*, there is no room for the species *G. crinitum* at all. But if there be a species *G. crinitum*—and it must be here repeated that 2159/1 and 2159/2 are undoubtedly conspecific—then there was no room for the re-issue of part of that species as *G. parviflorum* because it happens to agree exactly with the "Gentea Mts." portion of n. 2158/2. For this very "Gentea Mts." plant agrees badly with n. 2158/1, which is the type of *G. parviflorum*, and agrees still less with the rest of 2158/2, along with which it was issued. At the time that Dr. Wallich made this change in the designation and number of 2159/1, he issued three more gatherings as *G. parviflorum*. Two of these appear as 2158/D, both were collected by the same botanist (Buchanan-Hamilton), at the same place (Goalpara in Assam), though at different seasons of the year. Dr. Buchanan-Hamilton named both "Leonurus farinosus," and as a matter of fact they are identical, and are moreover the same as the "Sillet" portion of 2158/2. They are specimens of *G. parviflorum* VAR. *farinosa*, and therefore of true *G. multiflorum* Benth. The remaining gathering belonged to *Herb. Finlayson* from Siam; it is the same as 2158/1, and therefore is typical *G. parviflorum*.

In *Pl. As. Rar.* ii (1831)—TABLE XIII, column 3—Mr. Bentham followed Dr. Wallich's disposition of 1829, so that no remark is called for regarding this work. But in *Lab. Gen. et Sp.* (1835) and again in *DC. Prodr.* xii (1848)—TABLE XIII, column 4—Mr. Bentham notes the confusion introduced by Dr. Wallich into *Cat.* n. 2158/2, and to rectify it raises to specific rank the "Sillet" portion of that gathering as *G. multiflorum*, though rather strangely he does not mention the Goalpara plant 2158/D, which exactly agrees with the type of his *G. multiflorum*. Having separated off *G. multiflorum*, Bentham therefore confines to *G. parviflorum* three gatherings; n. 2158/1 (which he supposed to be Nepalese, but which in reality came from Heyne's Herbarium and the exact locality of which we cannot now ascertain), n. 2158/C (which was originally issued as n. 2159/1), and the "Gentea Mts." portion of n. 2158/2, which is conspecific with n. 2158/C. In these works therefore—and Drs. Walpers and Miquel have both followed his arrangement—Bentham has advanced to specific

rank a plant that is only a variety of *G. parviflorum*, while he has described as *G. parviflorum* a mixture of that species and *G. crinitum*.

But the fact that n. 2158/1 and n. 2158/E are, even if varietally separable, still conspecific with n. 2158/D and with the "Sillet" portion of n. 2158/2 could not long pass undetected, so that it is not surprising to find that in the type Wallichian herbarium—preserved by the Linnean Society of London—the necessary reduction has been effected. There, however, in place of *G. multiflorum* having been again merged in *G. parviflorum*, typical *G. parviflorum* Wall., *Cat.* n. 2158/1 (1828) has been named *G. multiflorum* Benth., a name that dates from 1835; and the name "*G. parviflorum*" has been restricted to n. 2158/C and the part of n. 2158/2 that is the same as 2158/C—to the gatherings, in fact, that do not belong to *G. parviflorum* at all. The species to which they do belong—for these gatherings are undoubtedly conspecific with n. 2159/2—is thus provided with two names, *G. parviflorum* and *G. crinitum*. This result is masked, so far as the Type-Herbarium is concerned, by the manner in which the specimens have been there glued down, for n. 2158/C, the transfer of which to *G. parviflorum* may be said to have given rise to the confusion, occurs on sheet 1, while n. 2158/1 occupies sheet 4. This being the case, and further because true *G. parviflorum* has become more familiarly known as *G. multiflorum*, it almost seems advisable to allow the names indicated in column 5 to stand. But the practical objections are insuperable. For first, there is no room for both "*G. parviflorum*," as understood in the Linn. Soc. Herbarium, and *G. crinitum*. Again, since the Linn. Soc. "*G. parviflorum*" is based on 2158/C, which only received the name *G. parviflorum* in 1829, it is the name *G. crinitum* (which in any case dates from 1828) that must stand. This being so, the suppression of the Wallichian name *G. parviflorum* in favour of Bentham's name *G. multiflorum* has nothing left to justify it. For even in 1828 Wallich's *G. parviflorum* contained two gatherings of that species as against one gathering that should have been excluded, and even after his readjustment of 1829 contained five gatherings of the species against only two of another. And, further, though it is true that *all* the specimens named *G. multiflorum* in the Linn. Soc. Herbarium are conspecific, we know that Mr. Bentham himself in the two works in which he described *G. multiflorum* only applied the name to *one variety* of that species. Sir Joseph Hooker in *Flor. Brit. Ind.*, iv (1885) is thus amply justified in suppressing Bentham's name *G. multiflorum*. And as his treatment —Table XIII, column 6—restores Wallich's arrangement of 1829 and Bentham's of 1831, thus removing all the confusion subsequent to these dates, it is only necessary further to eliminate from *G. parviflorum* those gatherings of *G. crinitum* that were unfortunately included in it by Wallich and restore them to the latter species.

Specimens from Java (*G. dichotomum* Zoll. et Mor.) have unfortunately not been available for study. But the position of the Java plant hardly admits of a doubt. The original description of the species by its authors is quite satisfactory, and (unconsciously) lays emphasis on the corolline characters that indicate its position in § Stenostoma "*tubo corollino subfiliformi faucem versus tandam*[1] [*tantum*] *dilatato* "(*nec ut in reliquis Gomphostemmatis supra medium inflato*)." Bentham, writing of authentic specimens in *Herb. DC.*, says "*valde affine* G. parvifloro; *calycis dentes minus acuminati*," while Miquel goes further "*calycis dentibus minus acuminatis* G. parvifloro *differt cui forsan nimis affine.*" That is to say, according to both Bentham and Miquel, *G. dichotomum only* differs from *G. parviflorum* in having less acuminate calyx teeth. Neither Bentham nor Miquel state precisely whether the calyx teeth are or are not shorter than the calyx tube, but the original description says "*calycibus 5-fidis*," which implies, unless the term is loosely applied, that the teeth are shorter than the tube is. Both Bentham and Miquel, however, mention a character omitted by Zollinger and Moritzi "*bracteis calyces æquantibus.*" This makes it differ *both* from *G. parviflorum* and *G. crinitum*, but only to the extent of almost assuring one that *G. parviflorum* and *G. crinitum* are not specifically separable, and that in *G. dichotomum* exists the intermediate form necessary to support the formal union of

---

[1] It should be noted that Walpers (*Repert.* vi, 684) corrects this misprint into "*tandem.*" But this alteration altogether annuls the force of the parenthetic remark which follows. And Miquel, who *did* elaborate the genus—the *Repertorium* is, as its name implies, only a compilatory work—recognises the true meaning of the sentence and makes (*Flor. Ind. Bat.* ii, 986) the obviously correct alteration.

these two Wallichian species. In the absence, however, of specimens of *G. dichotomum* it is necessary either to recognise that as a species, or to join it to one or other of its near allies. Now from what has been demonstrated above it will be seen that under the name "*G. parviflorum*" it is in reality a form of *G. crinitum* that Bentham and Miquel (who follows Bentham closely) are comparing with *G. dichotomum*. And as the character wherein *G. dichotomum* is said by them alone to differ from this form of *G. crinitum*, coupled with the character implied in the original description gives us two out of the three points wherein true *G. parviflorum* alone differs from this form of *G. crinitum*, it appears manifest that *G. dichotomum* must at present be looked upon as conspecific with true *G. parviflorum*.

With the gathering of *G. crinitum* from Tavoy, to which since 1829 that name had been restricted, Sir Joseph Hooker has (1885) associated a somewhat different-looking but undoubtedly conspecific plant collected by Dr. Griffith in Malacca. This is *G. crinitum* VAR. *Griffithii* of the present paper.

In the group *Parviflora* there is evidently a very great difference in the rank of the various forms separated. The only distinctly separable plant is *G. microcalyx* (though even as regards this—p. 251—union with another form has been suggested), and it is very probable that only a few more gatherings from intermediate localities will be required to provide the intermediate forms necessary to prove that all the others are simply local manifestations of one protean species. And while the absence of these prevents the writer from formally proposing the necessary reductions, the time appears to have come for indicating the probable nature of these. If only floral characters are attended to, we can recognise but two species, viz.—

A. G. MICROCALYX *Prain;* corollæ tubo fauce vix inflato, calycis dentibus brevissimis.

B. G. PARVIFLORUM *Wall. Cat.* 1829 (*nec* 1828) *parum emend.;* corollæ tubo fauce distincte inflato, calycis dentibus elongatis.

VAR. *α. farinosa;* foliis petiolatis subtus farinoso-tomentosis, bracteis omnibus ovatis = G. multiflorum *Benth., DC. Prodr.* xii, 552.—Leonurus farinosus *Ham. Mss. in Wall. Cat.* 2158/D. (G. parviflorum VAR. farinosa *Prain uti supra*).

VAR. *β. typica;* foliis petiolatis bracteis lanceolatis = G. parviflorum *Wall. Cat.* 2158/1, 2158/E.—G. dichotomum *Zoll. & Mor., Verzeichn.* 54. (G. parviflorum VAR. typica *uti supra*).

VAR. *γ. crinita;* foliis petiolatis bracteis (exterioribus exceptis) lanceolatis = G. crinitum *Wall. Cat.* 2159/1, 2159/2.—G. Thomsoni *Benth. in Herb. Ind. Or. H. f. & T. T.* (G. crinitum VAR. typica *et* G. Thomsoni *uti supra*).

VAR. *δ. Griffithii;* foliis sessilibus bracteis (exterioribus exceptis) lanceolatis = G. crinitum *Hook. f., Flor. Brit. Ind.* iv, 698, *syn.* Wall. Cat. 2159 *exclus.* (G. crinitum VAR. Griffithii *Prain uti supra*).

V. Eriocarpon; *verticillastris remotis axillaribus, calyce parum costato intus tubo dentibusque glabro, ovario puberulo, nuculis globosis.*

11. Gomphostemma eriocarpon *Benth.* (1829).

Elata erecta caule gracili subterete, *foliis* petiolatis basi attenuatis elliptico-oblongis acutis grosse dentatis, supra parce hispidulis subtus petiolis caulibusque tomentosis, *verticillastris* paucifloris densis, *bracteis* ovatis denticulatis vel linearibus integris supra glabris, *calycis* viridis tubo dentibus anguste lanceolatis apice filiformibus æquilongo, *corolla* flava fere recta calyce 3-plo longiore, extus villosa, *stylo* glabro, *nuculis* nigrescentibus dense tomentosis lævibus.—G. eriocarpon *Benth. in Wall. Cat.* n. 2710 (1829)

et *Pl. As. Rar.* ii, 12 (1831).—G. eriocarpum *Benth., Lab. Gen. et Sp.* 649 (1835) et *DC. Prodr.* xii, 552 (1848); *Walp., Rep.* iii, 897 (1845); *Hook. f., Flor. Brit. Ind.* iv, 698 (1885).—G. oblongum *Wight, Icones* iv, t. 1457 (1850); *Miq., Flor. Ind. Bat.* ii, 986, *in parte* (1856); *nec Wall.*—Leonurus tomentosus *Herb. Madr., syn. in Wall. Cat.* (1829).

In India Australi; Courtallam, *Wight!* Carnatic, *G. Thomson!* in collibus Anamallai et in Tinivelli, *Beddome.*

Caulibus 90—120 cm. altis, petiolis 1·25 cm. longis, laminis sensim attenuatis 7—11 cm. longis his 3 cm. latis, supra pilis nunc simplicibus nunc stellatis ornatis, verticillastris sub-10-floris, bracteis 10—14 mm. longis his 2—5 mm. latis, *calyce* 12 mm. longo hoc 4 mm. lato—tubo calycis 6 mm. longo, dentibus 6 mm. longis his basi 2 mm. latis dimidio superiore subulatis, *corollæ* tubo 20 mm. longo—parte tubi æquali 15 mm. longa, limbo 4 mm. lato, labio postico 7 mm. longo hoc 4 mm. lato, labio antico 7 mm. longo hoc 8 mm. lato, *nuculis* maturis 5 mm. longis his 4·5 mm. latis.

Plate 90. Gomphostemma eriocarpon *Benth.* Specimens from Courtallam, *Wight.*

A very distinct species forming a monotypic group most nearly allied to *Parviflora*. Though undoubtedly a member of § Stenostoma, its hirsute ovary allies it to *Lucida*, with one member of which group it has been confounded. It thus helps to connect § Stenostoma with § Eugomphostemma.

§§§ Eugomphostemma Prain (1890); corollæ tubo intus glabro, parte æquali calyce longiore, limbo amplo labiis majusculis; nuculis 4.—*Prasium* Roxb. (1814); Blume (1826); nec Linn.

VI. Lucida; *verticillastris remotis axillaribus, calyce prominenter costato intus tubo parce dentibus densius hirsuto, ovario dense villoso, nuculis late ovatis.*—*Prasium* Blume, Bijdr. 840 (1826); nec Linn.

12. Gomphostemma Philippinarum *Benth.* (1848).

Elata erecta caule parum sulcato, *foliis* breve petiolatis elliptico-ovatis apice acutis basi attenuatis margine breve serratis, supra scabro-hispidulis subtus caulibusque floccoso-tomentosis, *verticillastris* multifloris floribus singulis pedicellatis, *bracteis* parvulis lanceolatis, *calycis* dense tomentosi dentibus triangularibus breviter acuminatis tubo multo brevioribus, *corolla* lutea antice incurva calyce plus 3-plo longiore, extus (lobis labii antici exceptis) pubescente, *stylo* versus apicem pilis divergentibus perpaucis ornato, *nuculis* immaturis hirsutis.—Gomphostemma Philippinarum *Benth., DC. Prodr.* xii, 551 (1848); *Vidal, Phaner. Cuming.* 71 et 136 (1885) et *Plant. Vasc. Filipin.* 214 (1886) *nomen.*

In archipel. Philippinarum; in ins. Bohol, *Cuming* n. 1840! (icon. et sp. ex *herb. Kew.* benevolenter comm. vidi).

Caulibus circa 50 cm. altis, petiolis 1·5—3 cm. longis, laminis 11—18 cm. longis his 4—7 cm. latis, subtus caulibusque parcius tomentosis, a medio sensim attenuatis, verticillastris sub-6-floris, pedunculis propriis sub-2 mm. longis, bracteis 8 mm. longis his 2 mm. latis, pedicellis 3—5 mm. longis, bracteolis 2—3 mm. longis, *calyce* 10 mm. longo hoc 5 mm. lato—tubo calycis 8 mm. longo, dentibus 2 mm. longis

his basi 2·5 mm. latis, *corolla* 32 mm. longa—parte tubi æquali 16 mm. longa, limbo 8 mm. lato, labio postico margine integro 5 mm. longo hoc 8 mm. lato, labio antico 8 mm. longo hoc 16 mm. lato, *styli* lobis perbrevibus; *nuculis* nondum maturis.

PLATE 101. Gomphostemma Philippinarum *Benth.* Specimen from Bohol, *Cuming* n. 1840.

This plant is very nearly related to *G. oblongum*, differing principally from the types of that species in having shorter calyx teeth, and hairs on the style. Though it is here allowed to retain the rank given it by Mr. Bentham, it is probably no more than a form of *G. oblongum*, hardly separable even as a variety.

13. Gomphostemma Scortechinii *Prain* (1890).

Elata erecta caule subterete, *foliis* subsessilibus elliptico-oblongis vel obovatis acutis basi attenuatis margine subserratis vel integris, supra sparse hirsutis subtus caulibus petiolisque brevissimis parcius tomentosis, *verticillastris* multifloris, floribus singulis pedicellatis, *bracteis* subulatis pedicellis rufo-tomentosis æquilongis, *calycis* rufescentis dentibus lanceolatis acutis tubum excedentibus, *corolla* majuscula flava antice incurva calyce 3-plo longiore, extus tomentosa, *stylo* versus apicem pilis divergentibus parce hirsuto, *nuculis* brunneis apice hispidis sublævibus.

VAR. *typica;* laminis margine serratis vel integris.

In peninsula MALAYANA; Perak, in Gunong Tujok, *Scortechini* (bis)!

VAR. ? *Helferi;* laminis margine crenatis.—G. oblongum VAR.? Helferi *Hook. f., Flor. Brit. Ind.* iv, 697.

In BURMA inferiore; Tenasserim, *Helfer* n. 4043! (calyces 3 ex *Herb. Kew.* benevolenter comm. tantum vidi).

Caulibus 60—100 cm. altis, petiolis 0·5—1 cm. longis, laminis 20—30 cm. longis his 12—16 cm. latis, subtus parce tomentosis vel nonnunquam glabriusculis, basi sensim attenuatis, verticillastris sub-20-floris, bracteis 8 mm. longis his 0·5 mm. latis, pedicellis 8—10 mm. longis, *calyce* 22 mm. longo hoc 7 mm. lato—tubo calycis 10 mm. longo, dentibus 12 mm. longis his basi 4 mm. latis, *corolla* 60 mm. longa—parte tubi æquali 35 mm. longa, limbo 11 mm. lato, labio postico margine sub-2-dentatim emarginato 9 mm. longo hoc 12 mm. lato, labio antico 12 mm. longo hoc 21 mm. lato, lobo medio oblongo margine truncato, *nuculis* 8 mm. longis his 5·5 mm. latis.

PLATE 93. Gomphostemma Scortechinii *Prain.* Specimen from Perak, *Scortechini.*

The typical form of this plant seems very distinct, and is characterised by having dense whorls, the individual flowers of which are pedicelled. Its nearest ally is *G. oblongum*, from the type of which it differs in having serrate leaves, a rusty tomentum and a hirsute style.

The crenate leaves of the plant here considered a possible variety at once bring it near to *G. oblongum*, with which species Sir Joseph Hooker has tentatively placed it. But the calyx is unlike that of typical *G. oblongum*, and the 3 calyces examined by me agree so precisely with those of *G. Scortechinii*—one of them, moreover, has a pedicel 4 mm. long—that in spite of the fact that the leaves are crenate (a character which does not hold good in any other member of the *Lucida*) it seems preferable in the meantime to remove it from *G. oblongum*.

14. Gomphostemma oblongum *Wall.* (1828).

Elata erecta caule subtetragono, *foliis* breve petiolatis elliptico-oblongis acutis basi abruptius attenuatis vel subtruncatis margine crenatis vel crenato-serratis, supra hispidulis subtus petiolis caulibusque dense tomentosis, *verticillastris* paucifloris densis, *bracteis* ovato-lanceolatis brevissimis, *calycis* sessilis cinereo-tomentosi dentibus lanceolatis acutis tubum æquantibus, *corolla* alba antice incurva calyce 3-plo longiore, extus (lobo labii antici medio excepto) parce æquabiliter pubescente, *stylo* glabro vel juvenili hirsuto, *nuculis* albidis apice pilosis lævibus.—G. oblongum *Wall.*, *Cat.* n. 2154 (1828); *Benth.*, *Wall. Pl. As. Rar.* ii, 12 (1831), *Lab. Gen. et Sp.* 648 (1835) et *DC. Prodr.* xii, 551, *in parte* (1848); *Walp.*, *Rep.* iii, 896 (1845); *Miq.*, *Flor. Ind. Bat.* ii, 986, *in parte* (1856); *Hook. f.*, *Flor. Brit. Ind.* iv, 697 (1885).

In Burma inferiore; Tavoy, *Gomez* (*Wall. Cat.* n. 2154)! Attaran, *Brandis*, n. 846! Moulmein, *Falconer!* Tenasserim, *Helfer*, n. 4041! In insulis Andaman; in colle "Mt. Harriet" prope Port Blair, 500 p. s. m. et ad Goplakabang, 100 p. s. m., *King!! mercenar.!* Rangachang, 100 p. s. m., *Prain!*

Caulibus 60—100 cm. altis, petiolis 1—2·5 cm. longis, laminis 15—30 cm. longis his 5—9 cm. latis, a medio petiolum versus attenuatis basi ipsa tamen sæpissime truncatis verticillastris sub-8-floris, bracteis 7 mm. longis his 2 mm. latis, *calyce* 15 mm. longo hoc 6·5 mm. lato—tubo calycis 7·5 mm. longo, dentibus 7·5 mm. longis his basi 4 mm. latis, *corolla* 45 mm. longa—parte tubi æquali 27 mm. longa, limbo 11 mm. lato, labio postico apice rotundato integro 9 mm. longo hoc 12 mm. lato, labio antico 15 mm. longo hoc 20 mm. lato, lobo medio oblongo antice sub-emarginato, *nuculis* 6 mm. longis his 4 mm. latis.

Plate 95. Gomphostemma oblongum *Wall.* Specimen from South Andaman, *King's Collector.*

Nearly related to *G. lucidum* and to *G. Scortechinii*, but usually easily distinguished from both by its glabrous style. The Java locality which appears in *DC. Prodr.* xii, 551, and which Miquel has copied in *Flor. Ind. Bat.* ii, 986, has been omitted by Sir Joseph Hooker. The opinion that *G. oblongum* occurred in Java seems to have arisen, not from Moritzi having identified Zollinger's plant erroneously, but from his considering *Prasium javanicum* Blume, which Zollinger's plant appears to be, conspecific with *Gomphostemma oblongum* Wall., which is only the case if the limits of the species are much extended. Miquel's *Gomphostemma oblongum* is a mixture of three plants:—

1. *G. oblongum* Moritzi=G. javanicum *Benth.*,
2. G. oblongum *Wall.*, and
3. *G. oblongum* Wight=G. eriocarpon *Benth.*

15. Gomphostemma javanicum *Benth.* (1835).

Elata erecta caule parum sulcato, *foliis* distincte petiolatis elliptico-ovatis oblongis vel lanceolatis acutis basi attenuatis margine breve serratis vel integris, supra sparse hirsutis subtus caulibus petiolisque parcius tomentosis, *verticillastris* multifloris floribus singulis pedicellatis, *bracteis* anguste ovatis, bracteolis subulatis pedicellis parum longioribus, *calycis* rufo-hirsuti dentibus late lanceolatis acutis tubo dimidio brevioribus, *corolla* flava antice incurva calyce duplo longiore, extus tomentosa, *stylo* glabro, *nuculis* brunneis apice hispidis lævibus.—G. javanicum *Benth.*, *Lab. Gen. et Sp.* 650 (1835); *Walp.*, *Rep.* iii, 898 (1845); *Benth.*, *DC. Prodr.* xii, 553 (1848); *Miq.*, *Flor. Ind. Bat.* ii, 986 (1856).—G. oblongum *Mor.*,

Syst. Verzeichn. 53 (1846); *Benth.*, *DC. Prodr.* xii, 551, *in parte* (1848); *Miq.*, *Flor. Ind. Bat.* ii, 986, *in parte* (1856), *nec Wall.*—Prasium javanicum *Blume*, *Bijdr.*, 840 (1826).—P. phlomoides *Reinw. in sched. fide Miq.*, *Flor. Ind. Bat.* ii, 986 (1856), *nec Blume.*

In archipel. MALAYANO; in ins. Java, in sylvis montosis humidis, frequens, *Blume*, *Reinwardt*, *Zollinger* n. 1990, *Horsfield n.* 38! *Teysmann!* *Kurz!* *Forbes!*

Caulibus 50—80 cm. altis, basi subteretibus ("suffrutex," *Forbes in sched.*), petiolis 1—3 cm. longis, laminis 8—14 cm. longis his 3—6 cm. latis, subtus caulibusque pilis flavescentibus divergentibus parcissime tomentosis, a medio sensim attenuatis, verticillastris sub-12-floris, pedunculis propriis sub-4 mm. longis, bracteis 10 mm. longis his 2 mm. latis, pedicellis 4—7 mm. longis, bracteolis 10 mm. longis, *calyce* 16 mm. longo hoc 7 mm. lato—tubo calycis 10 mm. longo, dentibus 6 mm. longis his basi 4 mm. latis, *corolla* 35 mm. longa—parte tubi æquali 16 mm. longa, limbo 9 mm. lato, labio postico margine integro 7 mm. longo hoc 8·5 mm. lato, labio antico 10 mm. longo hoc 18·5 mm. lato, lobo medio oblongo margine integro, *styli* lobis distincte recurvis, *nuculis* 7 mm. longis his 5·5 mm. latis.

PLATE 102. Gomphostemma javanicum *Benth.* Specimen from Java, *Horsfield.*

This is nearly allied to *G. Scortechinii*, although by the much smaller leaves and flowers, the much shorter calyx teeth and the glabrous style it is sufficiently easily distinguished from that species. The leaves are sometimes serrate, sometimes crenate, sometimes entire. This is the plant intended in Blume's *description* of *Prasium javanicum*, but Dr. Miquel informs us that this, according to a sheet sent to Miquel by Dr. Blume himself, is the plant that was named by Reinwardt *Prasium phlomoides.* It is not impossible that both species may have borne the same manuscript name in Reinwardt's Herbarium; however this may be, Blume's description of *Prasium phlomoides* does not apply to this plant. The nearest ally of the plant is the following, which, though easily distinguished by general habit and appearance, is perhaps hardly varietally separable from it.

16. Gomphostemma rugosum *Prain* (1890).

Elata erecta caule terete lignoso robusto, *foliis* distincte petiolatis elliptico-ovatis acutis margine serratis, supra lucidis brevissime hispidulis mox glabrescentibus subtus petiolis caulibusque densissime rufo-lanatis, *verticillastris* multifloris densis brevissime pedunculatis, *bracteis* exterioribus ovato-lanceolatis reliquis lanceolatis calyce breve pedicellato brevioribus, *calycis* dense rufo-lanati dentibus tubo brevioribus, *corolla* flava apice antice incurva calyce 3-plo longiore, extus (lobo labii antici medio excepto) villosa, *stylo* glabro, *nuculis* brunneis apice pilosis sublævibus.—G. lucidum *Wall.*, *in parte et quoad Cat.* n. 2156/1 (1828) vix *Benth. in Pl. As. Rar.* ii, 12.

JAVA; in HORT. BOGOR. cult., *Kurz* n. 1154! In BURMA inferiore; Amherst, *Falconer* n. 1033! Tenasserim, in Chappedoung, *Wallich*, Cat. n. 2156/1.

Caulibus 60—100 cm. altis, petiolis 3—6 cm. longis, laminis 18—25 cm. longis his 6—9 cm. latis, basi attenuatis, verticillastris sub-20-floris, bracteis 10 mm. longis exterioribus ovato-lanceolatis margine serrulatis 5 mm. latis, reliquis subulatis integris 1·5 mm. latis, *calyce* 14—15 mm. longo hoc 6 mm. lato—tubo calycis 9 mm. longo, dentibus 6 mm. longis his basi 3·5 mm. latis, *corolla* 45 mm. longa—parte tubi æquali 25 mm. longa, limbo 10 mm. lato, labio postico obtuso 9 mm. longo hoc 11 mm. lato, labio antico 15 mm. longo hoc 19 mm. lato, lobo medio antice integro, *nuculis* 6 mm. longis his 4 mm. latis.

PLATE 103. Gomphostemma rugosum *Prain*. Specimen from HORT. BOGOR., cult., *Kurz* n. 1154.

Under the next species the relationship of this to *Gomphostemma lucidum* is discussed; the reasons both for separating it specifically from *G. lucidum* and for retaining that name to designate *Wall. Cat.* n. 2156/2 in place of using the name for this plant are there fully stated. This species bears to *G. lucidum* much the relationship that *G. oblongum* bears to *G. Philippinarum*, but its nearest ally is *G. javanicum*, of which it is probably only a form with larger and harsher leaves; in the wider view which will reduce all the forms of the *Lucida* group, except *G. phlomoides*, to an amplified *G. oblongum* this will hardly be separated as a variety from *G. javanicum*. In the meantime, however, it cannot be included in that species without inconveniently extending its limits. Like *G. javanicum*, it differs from the other species of *Lucida* in having a glabrous style; *G. oblongum*, however, to which all but one of the "Lucida" are probably reducible, is in this respect itself a connecting link since it includes plants in other respects identical, but some of which have styles glabrous even in bud, while others have hirsute styles at least in young flowers.

17. Gomphostemma lucidum *Wall.* ex *Benth.* (1831).

Elata erecta caule terete lignoso robusto, *foliis* breve petiolatis elliptico-ovatis vel oblanceolatis acutis margine serratis, supra lucidis piloso-hispidis demum glabrescentibus subtus petiolis caulibusque hirsutis, *verticiliastris* multifloris densis, *bracteis* lanceolatis subulatisve calyce sessili brevioribus, *calycis* dense rufo-lanati dentibus triangularibus tubo plus 3-plo brevioribus, *corolla* flava apice antice incurva calyce sub-3-plo longiore, extus (lobo labii antici medio excepto) dense villosa, *stylo* versus apicem pilis divergentibus barbato, *nuculis* albidis glabris sublævibus.

VAR. *typica;* laminis oblanceolatis vel lanceolatis, subtus nervis densius ceterum laxe rufo-tomentosis.—G. lucidum *Wall., Cat.* n. 2156/2 (1828); *Benth., Wall. Pl. As. Rar.* ii, 12 (1831), *Lab. Gen. et Sp.* 648 (1835) et *DC. Prodr.* xii, 551 (1848); *Walp., Rep.* iii, 897 (1845); *Hook. f., Flor. Brit. Ind.* iv, 697 (1885).

In ASSAM inferiore; in collibus Jaintea, *Clarke*, n. 5950! in montibus Khasia, *DeSilva* (*Wall. Cat.* n. 2156/2)! *Griffith*, n. 4038 *Kew. Dist.* (in parte)! *Hooker et Thomson! Clarke*, n. 14279! *Gallatly*, n. 243! *Oldham!* In BURMA superiore; apud Poneline, *Anderson!* In YUNNAN occidentali; prope Momien, *Anderson!*

VAR. *canescens;* laminis elliptico-ovatis, subtus æquabiliter albo-tomentosis.

In HIMALAYA orientali; in collibus Daphla, *Lister* n. 86! In ASSAM superiore; in Lakhimpur, *Griffith* n. 4038 *Kew. Dist.* (in parte et quoad n. 296 *Herb. Griff. propr.*)! *Masters!* apud Dibrugarh, *Clarke*, n. 37719!

Caulibus 60—100 cm. altis, petiolis 1—3 cm. longis, laminis 18—25 cm. longis his 4—9 cm. latis, basi sæpissime sensim attenuatis, verticillastris sub-16-floris, bracteis 10 mm. longis lanceolatis vel subulatis integris 1·5—2·5 mm. latis, *calyce* 14—15 mm. longo hoc 6 mm. lato—tubo calycis 10 mm. longo, dentibus 4 mm. longis his basi 3·5 mm. latis, *corolla* 40 mm. longa—parte tubi æquali 25 mm. longa, limbo 9 mm. lato, labio postico medio acuminulato 9 mm. longo hoc 10 mm. lato, labio antico 15 mm. longo hoc 18 mm. lato, lobo medio antice integro, *ovarii* tomento mox caduco, *nuculis* 6 mm. longis his 4 mm. latis.

PLATE 94. Gomphostemma lucidum *Wall.* Specimen of VAR. *typica* from Khasia, *Gallatly* n. 243.

This species is nearly related to *G. oblongum*, and may usually be distinguished by its serrate (not crenate) leaves which are narrower and smaller, as well as by its distinctly smaller flowers, the tomentum on which is generally rufous, and is always much denser than on those of *G. oblongum*. But the leaf character fails, since Andamans gatherings of *G. oblongum* shew crenate and serrate leaves on the same branch. Mr. Bentham has used as diagnostic the character "calycibus . . . dentibus . . . . abbreviatis" for *G. lucidum*, and "dentibus lanceolato-linearibus acutis" for *G. oblongum*—an expression which makes his *description* of *G. lucidum* refer exclusively to Wallich's *Silhet* plant, and which excludes Wallich's *Tenasserim* one. There is no specimen of *Wall. Cat.* n. 2156/1 at Calcutta, but Mr. Hemsley has very kindly compared for me at the Linnean Society's rooms a specimen from Amherst (*Falconer* n. 1033) which agrees with it exactly, and *Falconer* n. 1033 in turn is precisely the same as a plant (from the herbarium of the late Mr. Kurz) cultivated in the Buitenzorg garden. This plant is more nearly related to *G. javanicum*, with which it agrees (at the same time differing from *G. lucidum*) in having a glabrous style and in having a calyx with long teeth and distinct pedicels. But though from these specimens it is evident that *Wall. Cat.* n. 2156/1 is specifically distinct from *Cat.* n. 2156/2, I have refrained from restricting the name *G. lucidum* to Wallich's n. 2156/1. For *Falconer* n. 1033 and *Kurz* n. 1154 differ from true *G. javanicum* mainly in being densely tomentose, and might well be treated as a variety of that plant. But were this reduction made it would be necessary to submerge *G. javanicum* (1835) in *G. lucidum* (1828)—a course that would be highly inexpedient; for while it is true that *G. lucidum* (1828) *did* include *Wall. Cat.* n. 2156/1, it is equally true that *G. lucidum* (1831) as *described* in *Wall. Pl. As. Rar. and in all subsequent works* refers precisely to n. 2156/2 and explicitly *excludes* n. 2156/1 by the character "dentes calycini vix lineam longi." In the present paper therefore a figure has been given of, and the name *G. lucidum* is hereby expressly limited to, the plant which forms *Wall. Cat.* n. 2156/2.

As in the case of *G. Heyneanum*, the two varieties are very distinct, and yet there is no character of calyx or corolla wherein they differ.

18. Gomphostemma phlomoides *Benth.* (1835).

Elata erecta caule parum sulcato, *foliis* longius petiolatis late ovatis apice acuminatis basi abruptius attenuatis margine crenato-dentatis, supra molliter breve hirsutis subtus petiolis caulibusque dense floccoso-tomentosis, *verticillastris* paucifloris, *bracteis* majusculis ovato-lanceolatis acutis, bracteolis minimis, *calycis* breve pedicellati dense tomentosi dentibus triangularibus tubo duplo brevioribus, *corolla* lutea antice incurva calyce duplo longiore, extus (lobo labii antici medio excepto) parce æquabiliter pubescente, *styli* summo triente parce pilis divergentibus hirsuto, *nuculis* immaturis nigrescentibus apice pilosis sublævibus.—G. phlomoides *Benth., Lab. Gen. et Sp.* 649 (1835) et *DC. Prodr.* xii, 551 (1848); *Walp., Rep.* iii, 898 (1845); *Moritzi, Syst. Verzeichn.* 53 (1846); *Miq., Flor. Ind. Bat.* ii, 985 (1856).—Prasium phlomoides *Reinw.* ex *Blume, Bijdr.* 840 (1826).

In archipel. MALAYANO; in ins. Java in sylvis montosis altioribus, *Blume, Reinwardt, Horsfield* n. 136! *Hasskarl* n. 1597! in ins. Madura, apud Petjœden, *Teysmann* n. 1814!

Caulibus 60—100 cm. altis, petiolis 3·5—6 cm. longis, laminis 13—16 cm. longis his 8—11 cm. latis, verticillastris nunc densis nunc in ramos foliolatulos excrescentibus, bracteis 15—25 mm. longis his 3—5 mm. latis, bracteolis 5—7 mm. longis linearibus, pedicellis 2—3 mm. longis, *calyce* 12 mm. longo hoc 6 mm. lato—tubo calycis 8 mm. longo, dentibus 4 mm. longis his basi 3·5 mm. latis, *corolla* 25 mm. longa—parte tubi æquali

13 mm. longa, limbo 9 mm. lato, labio postico integro 6 mm. longo hoc 8 mm. lato, labio antico 9 mm. longo hoc 19 mm. lato, lobis lateralibus majusculis, *nuculis* maturis nondum communicatis.

PLATE 104. Gomphostemma phlomoides *Benth.* Specimens from Java, *Horsfield.*

This species is very distinct from the others of the group in often having the whorls disposed on short axillary branchlets with smaller leaves than those of the main stem. In this respect therefore it approaches the group *Pedunculata*. But its whorls are axillary and not on the old wood, and it is further distinguished by its hirsute ovary and its calyx prominently ribbed. Even when the whorls are condensed it is at once distinguished from the remaining *Lucida* by its smaller corolla very abruptly and considerably widened at the top; and from *G. oblongum*, with which Mr. Bentham and Dr. Miquel particularly compare it, it is further distinguished by its sparingly hirsute style. The slender part of the tube, though shorter than in any of the other *Lucida*, is not, as Miquel says, shorter than the calyx.

The various forms that are here included in the group *Lucida* have been in this paper kept apart in order to maintain as uniformly as possible the treatment adopted by the late Mr. Bentham. But though the intermediate forms which would warrant a reduction of these forms have not as yet been reported, there is evidence enough to show that reductions will ultimately be necessary, and it does not seem out of place to indicate here those that may have to be effected. Abandoning all reference to differences in the leaf edges and in the style, which even in some of the forms now differentiated are found to fail, and relying solely on differences in flower and fruit, we find that only three plants are at all clearly separable. These are:—

A. G. OBLONGUM *Wall., ampl.;* corolla tubo calyce multo longiore, nuculis maturis hirsutis.

VAR. *a. typica;* foliis majusculis haud rugosis breve petiolatis = G. oblongum *Wall. Cat.* 2154.—G. Philippinarum *Benth.*—G. Scortechinii *Prain.*

VAR. *β. parvifolia;* foliis minoribus subrugosis vel rugosis distincte petiolatis = G. javanicum *Benth.*—G. rugosum *Prain* (G. lucidum *Wall. quoad Cat.* n. 2156/1).

AREA GEOGR.; Andamans, Tenasserim, Malaya, Java, Philippinæ.

B. G. LUCIDUM *Wall., emend.;* corolla tubo calyce multo longiore, nuculis maturis glabris.

VAR. *a. typica;* foliis oblanceolatis vel lanceolatis = G. lucidum *Wall. Cat.* 2156/2 *tantum.*

VAR. *β. canescens;* foliis elliptico-ovatis subtus albo-tomentosis = G. lucidum VAR. canescens *Prain uti supra.*

AREA GEOGR.; Himalaya orientalis, Assam, Burma superior, Yunnan.

C. G. PHLOMOIDES *Benth.;* corolla tubo calycem parum excedente.
AREA GEOGR.; Java, Madura.

Even after the wholesale reduction indicated above has been effected, it will be noted—1, that *G. lucidum* is manifestly only the Indo-Chinese representative of the Malayan *G. oblongum;* and 2, that the only tangible character which separates these two is that the ovarian tomentum is altogether deciduous in *G. lucidum*, whereas it persists to some extent in *G. oblongum*. The two species therefore do not differ from each other so much as do *G. pedunculatum* and *G. Curtisii* (which two Mr. Hemsley *in litt.* has suggested the advisability of uniting), and, as in the case of these latter, it may be suggested that ultimately *G. lucidum* would be quite sufficiently differentiated if regarded as a local sub-species of *G. oblongum*, as has been indicated already in TABLE I (p. 230).

VII. Pedunculata; *verticillastris remotis axillaribus vel secus caulem aphyllum dispositis, calyce haud costato intus tubo dentibusque glabro, ovario glabro, nuculis ovatis.*

19. Gomphostemma pedunculatum *Benth.* (1885).

Elongata caule basi prostrato, *foliis* longe petiolatis ovatis acutis basi parum attenuatis margine serratis, supra hirsutis subtus caulibus petiolis pedunculisque dense tomentosis, *verticillastris* multifloris cymis laxis utrinque evolutis, *bracteis* rubidis late ovatis margine serratis calyce longioribus, bracteolis oblongo-lanceolatis, *calycis* rubidi extus bracieisque molliter hirsuti, dentibus late ovato-triangularibus tubo brevioribus, *corolla* sulphurea antice incurva calyce plus 2-plo longiore, extus glabrescente, *stylo* glabro, *nuculis* pallidis glabris punctulatis.—G. pedunculatum *Benth. Mss.* ex *Hook. f., Flor. Brit. Ind.* iv, 696 (1885).

In Assam inferiore; in montibus Khasia, infra Nurtiang, 2—3,000 p. s. m., *Hooker et Thomson !*

Caulibus plus 100 cm. longis flexuosis, prostratis, basi radicantibus apice tantum ascendentibus, foliis longe distantibus, petiolis 3·5—5 cm. longis, laminis 7—30 cm. longis his 4—15 cm. latis, cymis 2—8 cm. longis in axillis inferioribus et secus caulem aphyllum dispositis, bracteis 0·5—1·5 cm. longis his 0·5—1 cm. latis alternis bracteolis 5—15 mm. longis his 3—8 mm. latis, *calyce* 12 mm. longo hoc limbo 5 mm. lato—tubo calycis 6·5 mm. longo, dentibus 5·5 mm. longis his basi 3 mm. medio 4 mm. latis, *corollæ* tubo 25 mm. longo—parte tubi æquali 16 mm. longa hac 3 mm. lata, parte inflata 9 mm. longa, limbo 8 mm. lato, labio postico 5 mm. longo hoc 9 mm. lato, labio antico 6 mm. longo hoc 15 mm. lato, *nuculis* late ovatis 6 mm. longis his 4 mm. latis.

Plate 91. Gomphostemma pedunculatum *Benth.* Specimen from Nurtiang, Khasia, *Hooker & Thomson.*

The specimen figured is an example of the original gathering, but is evidently (*cf.* the original description) not very typical. The species is nearly allied to *G. Curtisii* from Penang and Perak; but its peduncles, bracts and calyces are more hirsute, its bracts are much larger, and its calyx teeth are very different, being much wider and a good deal shorter; the leaves also are larger than in the Malayan plant.

20. Gomphostemma Curtisii *Prain* (1890).

Elongata caule ascendente scabro, *foliis* longe petiolatis oblongo-ovatis acutis basi parum attenuatis margine denticulatis, supra hirsutis subtus petiolisque adpresse tomentosis, *verticillastris* multifloris cymis laxis utrinque evolutis, pedunculis glabris, *bracteis* anguste ovatis longe acuminatis margine integris calycem æquantibus rubidis, bracteolis lineari-lanceolatis, *calycis* rubidi extus bracteisque parcissime puberuli dentibus e basi triangulari longe lineari-lanceolatis tubum excedentibus, *corolla* alba antice incurva calyce 2-plo longiore, extus puberula, *stylo* glabro, *nuculis* pallidis glabris punctulatis.

In Peninsula Malayana; Penang, *Curtis* n. 1310 ! Perak, in Larut, *Scortechini* n. 924! *Wray* n. 1233!

Caulibus flexuosis basi haud radicantibus 90—120 cm. altis, *foliis* distantibus petiolis 3—12 cm. longis, laminis 8—12 cm. longis his 5—7 cm. latis, cymis 5—6 cm. longis secus caulem aphyllum tantum dispositis, bracteis 10—15 mm. longis his 4—5 mm. latis, alternis, *calyce* 14 mm. longo hoc 5 mm. lato—tubo calycis 6·5 mm. longo, dentibus 7·5 mm. longis his basi ipsa 3 mm. latis, triente imo subito attenuatis ceterum lanceolato-subulatis, *corollæ* tubo 25 mm. longo—parte tubi æquali 14 mm. longa, parte inflata

11 mm. longa, limbo 8 mm. lato, labio postico 4 mm. longo hoc 8 mm. lato, labio antico 7 mm. longo hoc 16 mm. lato, *nuculis* 6 mm. longis his 3 mm. latis, oblongo-ovatis apice rotundatis basi triquetris.

PLATE 92. Gomphostemma Curtisii *Prain*. Specimen from Perak, *Wray* n. 1233.

This species is so nearly allied to *G. pedunculatum* that Mr. Hemsley remarks of it "without dissection would be called *G. pedunculatum*." It is, however, as analysis shews, very distinct as species go in this genus; the diagnosis has been given already. The species is named in honour of Mr. C. Curtis of Penang, whose enthusiasm as a collector is only equalled by his obliging attention to the requests of correspondents. In this the cymes seem only to occur on the stems a long way below the leaves.

21. Gomphostemma chinense *Oliv.* (1884).

Elongata caule prostrata vel ascendens, *foliis* longiuscule petiolatis ellipticis vel ovato-ellipticis apice obtusis vel subacutis basi cuneatis rotundatisve margine undulato-denticulatis, supra breve hirsutis subtus petiolis caulibusque cano-pubescentibus, *verticillastris* multifloris cymis laxis utrinque evolutis, *bracteis* auguste ovatis acuminatis margine integris calycem æquantibus, extus pedunculisque tomentosis intus glabratis, *calycis* purpurascentis extus pubescentis dentibus lanceolatis acuminatis tubo æquilongis, *corolla* alba antice incurva calyce 4-plo longiore, extus puberula, *stylo* glabro, nuculis pallidis glabris punctulatis.—G. chinense *Oliv. in Hook., Icon. Plant.* xv, 54, t. 1468 (1884); *Hance in Jour. Bot.* xxv, 12 (1887).—G. chinensis *Forbes et Hemsl., Jour. Linn. Soc.* xxvi, 306 (1890).

In CHINA Australi; Fokien, apud Amoy, *Swinhoe;* Kwangtung, in collibus Lo-fan-shan, *Faber!* in ins. Hainan, ad Fau-lun, *B. C. Henry.*

Caulibus gracilibus basi subteretibus sæpe radicantibus 40—60 cm. altis, foliis distantibus petiolis 1—3 cm. longis, laminis 6—9 cm. longis his 3·5—4 cm. latis, supra æquabiliter stellato-tomentosis pilis longioribus simplicibus interspersis, cymis 4—5 cm. longis secus caulem aphyllum vel e basi caulis quasi radicalibus, bracteis 9—16 mm. longis his 5—8 mm. latis, oppositis, calyce 12 mm. longo hoc 5 mm. lato—tubo calycis 6 mm. longo, dentibus 6 mm. longis his basi 3 mm. latis, *corollæ* tubo 45 mm. longo —parte tubi æquali 30 mm. longa, parte inflata 15 mm. longa, limbo 8 mm. lato, labio postico 4 mm. longo hoc 8 mm. lato, labio antico 7 mm. longo hoc 16 mm. lato, *nuculis* 5 mm. longis his 3·5 mm. latis.

PLATE 97. Gomphostemma chinense *Oliv.* Specimens from Lo-fan-shan, *Faber* A—comm. *Ford;* B, C—ex *Icon. Plant.* xv, t. 1468.

A species very distinct from the other members of the group owing to its longer corolla and its leaves with stellate tomentum on the *upper* surface; by both characters it connects the *Pedunculata* with the *Melissifolia*. The upper lip of the corolla is shown in Mr. Oliver's plate as slightly emarginate, just as it is in *G. pedunculatum* and in *G. Curtisii*. The cymes in this species are borne on the very lowest portion of the stem in the Kew specimen; in one (of the same gathering) kindly communicated to Calcutta by Mr. C. Ford, F.L.S., of Hong-Kong, they occur along the stem, exactly as in *G. Curtisii*.

It may ultimately be possible to unite as sub-species the two first species of this group; in the meantime the necessary intermediate forms are altogether deficient. If, moreover, the character of lax inflorescence be found to fail in any of the three forms here defined, it will perhaps become possible to unite the two groups *Pedunculata* and *Melissifolia*.

VIII. Melissifolia; *verticillastris remotis axillaribus, calyce indistincte costato intus tubo dentibusque hirsuto, ovario glabro, nuculis subglobosis.*—*Prasium* Roxb., Hort. Beng. 45 (1814), nec Linn.

22. Gomphostemma Mastersii *Benth.* (1885).

Humilis vel elatior caule gracili parum sulcato scabro, *foliis* longe petiolatis ovato-oblongis apice acutis basi integra cuneatis vel raro truncatis margine ceterum minute crenato-serratis, supra beve hirsutis subtus nervis dense ceterum parce tomentosis, petiolis subscabris, *verticillastris* paucifloris densis vel raro verticillis inferioribus parum evolutis, *bracteis* exterioribus oblongis obtusis, reliquis lanceolatis, omnibus calyce brevioribus, bracteolis linearibus brevibus, *calycis* purpurascentis costis densius ceterum parce hirsuti dentibus lineari-lanceolatis apice subulatis tubo multo longioribus, *corolla* flava, extus brevissime puberula, calyce plus 2-plo longiore, *stylo* glabro, *nuculis* nigrescentibus glabris extus lævibus intus rugosulis.—G. Mastersii *Benth. in Herb. Ind. Or. H. f. & T.T.* ex *Hook. f., Flor. Brit. Ind.* iv, 699 (1885) —G. melissifolium *Wall., Cat.* n. 2157, *pro parte et syn.* Prasium melissifolium *Roxb. excl.* (1828).

In Assam inferiore; in collibus Jaintea, 2—3,000 p. s. m., *G. Mann!* In Silhet, *DeSilva! Clarke!* in montibus Khasia, 3—4,000 p. s. m., *Hooker et Thomson! Clarke* n. 44437! in collibus Lushai apud Lengti, *Prazer!* In Assam superiore; *Masters* n. 320 *in Herb. Kew., Jenkins!*

Caulibus ascendentibus imo basi tantum radicantibus, vel prostratis ramis ascendentibus, 6—25 cm. altis, radicibus fibrosis tuberis fusiformibus interspersis, petiolis 3—7 cm. longis, laminis supra æquabiliter stellato-tomentosis pilis longioribus simplicibus interspersis, 7—14 cm. longis his 3—9 cm. latis, verticillastris sub-10-floris nonnunquam cymis laxis utrinque evolutis, bracteis 16 mm. longis his exterioribus 8—12 mm. latis reliquis 2—4 mm. latis, *calyce* 18 mm. longo hoc 5 mm. lato—tubo calycis 7 mm. longo, dentibus 11 mm. longis his basi 3 mm. latis, *corolla* 40 mm. longa—parte tubi æquali 25 mm. longa, limbo 8 mm. lato, labio postico margine integro 6 mm. longo hoc 8 mm. lato, labio antico 8 mm. longo hoc 16 mm. lato, *nuculis* maturis 6 mm. longis his 4 mm. latis.

Plates 98B and 99. Gomphostemma Mastersii *Benth.* 98B. Specimen from Jaintea hills, *Mann.* 99. Specimen from Khasia, *Hooker & Thomson.*

This is a very distinct species marked by the presence of tubers amongst its roots. The characteristic tomentum of the upper surface of its leaves, consisting of a uniform, though not dense, stellate-pubescence, throughout which longer and stouter simple hairs are uniformly scattered, is very distinctive. This peculiar character the species shares with *G. chinense* (which has to be placed in the group *Pedunculata* owing to the flowers there being in lax cymes borne on the old wood below the leaves). Its flowers too are very like those of *G. chinense*, and it further shews its affinity with the group *Pedunculata* in having a coloured calyx and in having its whorls, as Sir Joseph Hooker has pointed out, sometimes lax—"shortly peduncled as in *G. pedunculatum*" (*F. B. I.* iv, 699). Still the whorls are *usually* dense, and in any case the calyx is distinctly, though not prominently, ribbed.

Small forms of the species a good deal resemble *G. velutinum*, to which it is perhaps most nearly allied; that species is at once distinguished by its velvety tomentum as dense on the upper as on the under surface of the leaves, by its shorter corollas, and by its roots without tubers. Its reduction to

G. ovatum has been suggested, and in externals large forms of this species do a good deal resemble specimens of *G. ovatum* VAR. *flaccida*. The tubers among the roots, the coloured and much longer-toothed calyx, the shorter narrower bracts, and the stellate hairs on the upper surface of the leaves (a character *never* exhibited by either variety of *G. ovatum*) amply distinguish this species from *G. ovatum*. Dr. Wallich originally gave this plant the Mss. name of *G. radicans*, but afterwards issued it as conspecific with *G. melissifolium*, the remaining member of the group to which it belongs: it is so unlike that species that the diagnostic points do not require to be dwelt upon.

23. **Gomphostemma velutinum** *Benth.* (1829).

Humilis caule gracili distincte sulcato dense velutino, *foliis* longe petiolatis ovatis basi integra cuneatis vel subtruncatis margine ceterum obtuse dentatis apice acutis, utrinque densissime stellato-velutinis, *verticillastris* paucifloris densis, *bracteis* exterioribus ovatis oblongisve, reliquis lanceolatis, omnibus calyce brevioribus, bracteolis linearibus brevibus, *calycis* viridis dense molliter hirsuti dentibus lanceolatis tubo æquilongis, *corolla* flava antice incurva, extus villosa, calyce 2-plo longiore, *stylo* glabro.—G. velutinum *Benth.*, *Wall. Cat.* n. 2709 (1829), *Wall. Pl. As. Rar.* ii, 13 (1831), *Lab. Gen. et Sp.* 649 (1835) et *DC. Prodr.* xii, 552 (1848); *Walp., Rep.* iii, 898 (1845); *Hook. f., Flor. Brit. Ind.* iv, 699 (1885).

In ASSAM inferiore; in "montibus Silhet," *Bruce* (*Wall. Cat.* n. 2709)! in montibus Khasia, 4,000 p. s. m., *Hooker et Thomson! Oldham!* apud Mansmai, 4,000 p. s. m., *Clarke* n. 45942!

Caulibus 8—12 cm. longis ascendentibus vel prostratis, ramis ascendentibus, radicibus omnibus fibrosis, petiolis 1—4 cm. longis, laminis 3—6 cm. longis his 2·5—3·5 cm. latis, verticillastris sub-6-floris, bracteis 5—8 mm. longis his 1—3 mm. latis, *calyce* 13 mm. longo hoc 4 mm. lato—tubo calycis 6 mm. longo, dentibus 7 mm. longis his basi 2 mm. latis, *corolla* 30 mm. longa—parte tubi æquali 14 mm. longa, limbo 8 mm. lato, labio postico 6 mm. longo hoc 8 mm. lato margine integro, labio antico 8 mm. longo hoc 16 mm. lato, *nuculis* maturis nondum communicatis.

PLATE 98A. Gomphostemma velutinum *Benth.* Specimen from Silhet, *Bruce* (*Wall. Cat.* n. 2709).

A very distinct species, easily recognisable by the dense tomentum on both surfaces of the leaves, and remarkable in having a uniform *stellate* tomentum on the upper surface as well as the lower. This is the smallest species of the genus.

24. **Gomphostemma ovatum** *Wall.* (1828).

Humilior caule gracili subsulcato scabro, *foliis* longe petiolatis membranaceis supra parce hispido-pubescentibus subglabrisve, laminis ovatis late ellipticis apice obtusis basi truncatis vel raro cuneatis margine crenato-dentatis, *verticillastris* multifloris densis, *bracteis* exterioribus foliaceis ovatis obtusis margine crenato-serratis calycem excedentibus, reliquis ovato-acutis calycem æquantibus, bracteolis linearibus brevibus, *calycis* viridis dentibus lanceolatis tubo brevioribus, *corolla* flava apice antice incurva calyce sub-4-plo longiore, extus puberula, *stylo* glabro, *nuculis* brunneis glabris extus lævibus intus rugosulis.

VAR. *typica;* foliis subtus, bracteis extus, petiolisque æquabiliter molliter tomentosis.—G. ovatum *Wall. Cat.* n. 2155 (1828); *Benth., Wall. Pl. As. Rar.* ii, 12 (1831), *Lab. Gen. et Sp.* 649 (1835) et *DC. Prodr.* xii, 552 (1848); *Walp., Rep.* iii, 897 (1845); *Hook. f., Flor. Brit. Ind.* iv, 699 (1885).

In HIMALAYA centrali et orientali; Nepal, in colle Chandnagheri, *Wallich!* Sikkim, ad Rishap 2,000 p. s. m., *Clarke* n. 12498! ad ripas riv. Ryang, *G. Gammie!* In ASSAM superiore; *Masters!*

VAR. *flaccida;* foliis læte viridibus, flaccidis, subtus bracteisque extus (nervis puberulis exceptis) glabris, petiolis parce puberulis.

In HIMALAYA orientali; ad ripas fl. Rangiet, 2,500 p. s. m., *Anderson!* infra Darjiling, 2,500 p. s. m., *Kurz!* ad Sittong, 3,000 p. s. m., *King!* In ASSAM inferiore; in collibus Jaintea, *Simons!* in montibus Khasia, 4,000 p. s. m., *Mann!*

Caulibus 15—30 cm. altis ascendentibus imo basi radicantibus, petiolis 2—4 cm. longis, laminis 14—16 cm. longis his 10—12 cm. latis, verticillastris 12—30-floris, bracteis exterioribus 18 mm. longis his 12 mm. latis, reliquis 12 mm. longis his 3—4 mm. latis, *calyce* VAR. *typicæ* 10 mm. longo hoc 4 mm. lato—tubo calycis 6 mm. longo, dentibus 4 mm. longis his basi 2 mm. latis, calyce VAR. *flaccidæ* 12 mm. longo—tubo 7 mm. longo, dentibus 5 mm. longis, *corolla* 40 mm longa—tubi parte æquali 30 mm. longa, limbo 10 mm. lato, labio postico integro 6 mm. longo hoc 12 mm. lato, labio antico 16 mm. longo hoc 18 mm. lato, lobo medio amplissimo, *nuculis* 6 mm. longis his 4 mm. latis.

PLATE 96. Gomphostemma ovatum *Wall.* Specimen from Nepal, *Wallich* (*Cat.* n. 2155).

Most nearly allied to *G. melissifolium*, from which it differs in having larger leaves, the outer bracts somewhat larger and all obtuse, the whorls many-flowered and the upper lip of corolla entire, not emarginate. The habit also is usually different in *G. ovatum;* the stems are ascending and only rooting near the base, in *G. melissifolium* prostrate or scandent and longer, often rooting below for half their length. The varieties differ a good deal in appearance, but there are no good diagnostic marks except absence of pubescence in VAR. *flaccida*, which bears to the type precisely the relationship borne to *G. strobilinum* by its VAR. *viridis*.

25. Gomphostemma melissifolium *Wall.* (1828).

Elongata, rarissime nana, caule gracili distincte sulcato scabro, *foliis* petiolatis membranaceis supra glabris subtus nervis petiolisque scabride tomentosis ceterum glabris, laminis ellipticis basi cuneatis apice acutis margine minute dentatis, *verticillastris* paucifloris densis, *bracteis* exterioribus ovatis acutis margine integris calycem paulo superantibus, reliquis lanceolatis calyce brevioribus, bracteolis linearibus brevibus, *calycis* viridis dentibus lanceolatis tubo æquilongis, *corolla* flava vel purpurascente antice incurva, extus puberula, calyce plus 3-plo longiore, *stylo* glabro, *nuculis* rubris glabris, extus intusque lævibus.—G. melissifolium *Wall., Cat.* n. 2157 (1828); *Benth., Wall. Pl. As. Rar.* ii, 12 (1831); *pro parte et quoad syn.* Prasium melissifolium *Roxb.*—G. melissæfolium *Benth., Lab. Gen. et Sp.* 649 (1835) et *DC. Prodr.* xii, 552 (1848); *Walp., Rep.* iii, 897 (1845); *pro parte.*—G. melissæfolium *Hook. f., Flor. Brit. Ind.* iv, 698 (1885).—Prasium melissifolium *Roxb., Hort. Beng.* 45 (1814), *Flor. Ind.* iii, 26 (1832) et *Icon. ined.* x, t. 119.

In Assam inferiore; Khasia, apud Jheria, 250 p. s. m., *Clarke* nn. 44946! 44953! Silhet, *Roxburgh*, *DeSilva!* Cachar, *Prazer!* In Hort. Bot. Calcutta, cult., *Roxburgh* (icon.)! *Falconer!*

Caulibus 50—250 cm. longis, gracilibus, scandentibus vel prorsus prostratis et a medio deorsum radicantibus, rarissime brevibus (10—30 cm. altis) suberectis, laminis 7—10 cm. longis his 3·5—5 cm. latis, verticillastris sub 6-floris, bracteis exterioribus imis 20 mm. longis his 8 mm. latis, reliquis plurimis 10—12 mm. longis his 5—6 mm. latis, *calyce* 10 mm. longo hoc 4·5 mm. lato—tubo calycis 5 mm. longo, dentibus 5 mm. longis his basi 2·5 mm. latis, *corolla* 35 mm. longa—tubi parte æquali 20 mm. longa, limbo 8 mm. lato, labio postico 7 mm. longo hoc 9·5 mm. lato margine emarginato, labio antico 10 mm. longo hoc 14·5 mm. lato, *nuculis* 4 mm. longis his 3 mm. latis.

Plate 100. Gomphostemma melissifolium *Wall.* A—Specimen from Jheria Ghât. *Clarke* n. 44953. B—Ex *Roxburgh*, *Icon. ined.* x, t. 119.

This species is distinguished from *G. crotum*, to which it is most nearly allied, by its whorls being fewer-flowered, its bracts acute, its upper lip of corolla emarginate, its leaves smaller and narrowed to both extremities and perfectly glabrous above. From *G. Mastersii*, with which it was distributed by Dr. Wallich, it also differs in having smaller leaves, fewer-flowered whorls, longer bracts, upper lip of corolla emarginate, and leaves quite glabrous above.

The plant figured by Dr. Roxburgh (Plate 100B—copied from *Roxb., Icon. ined.* x. t. 119) grown in the Botanic Garden at Calcutta is dwarf and stunted, and though the plant has been long lost to culivation, there is preserved in the Calcutta Herbarium a cultivated specimen collected subsequent to the distribution of Dr. Wallich's East Indian Herbarium, which shows that after being in cultivation during a quarter of a century it continued to be erect in habit and dwarfed. In one Cachar gathering—that by Prazer—the plant is described as having stems about 8 feet! long, rambling over adjacent bushes; some of the specimens communicated by this collector are tops of stems 2—3 feet long with no sign of rootlets. These specimens thus corroborate Dr. Roxburgh's statement that the species is scandent—a habit which it shares with *G. nutans*. In Dr. Wallich's gathering and in all subsequent gatherings except that of Prazer, the stems are, as described by Sir Joseph Hooker, prostrate and rooting below for half their length.

The flowers in Dr. Roxburgh's figure are yellow: this is the colour noted in most field gatherings; Prazer's Cachar gathering has, however, blueish corollas with purple lips and a white throat. On the page bearing the original figure of Roxburgh's plant there is brick-red stain, which in Dr. Roxburgh's handwriting is noted as having been made by the fresh "bright red" nutlet; the ripe nutlets of a dried specimen (Clarke n. 44946), noted as "orange brown," impart to paper a stain precisely the same as the stain referred to, which was made in 1813!

There are not at Calcutta any specimens from Sikkim, and there are no Assam ones from an elevation of over 300 feet above sea-level.

INDEX.

Anthocoma *Prain* . . . 250; 243
ANTHOCOMA *Zoll.* 231
Anthocoma flavescens Zoll. 232
Eriocarpon *Prain* . . . 258; 244
EUGOMPHOSTEMMA Prain . . 259; 244
Gomphostemma *acaule* Kurz . 247
chinense *Oliv.* . 267
chinensis Forbes & Hemsl. . . 267
crinitum *Wall.* . 254
VAR. Griffithii *Prain* . . 254
VAR. typica . 254
Curtisii *Prain* . 266
dichotomum Hassk. 232
dichotomum Zoll. & Mor. . . 252
elatius Wall. . 245
eriocarpon *Benth.* 258
eriocarpum Benth. 259
flavescens *Miq.* 232, 250
Hemsleyanum *Prain* . . 250
Heyneanum *Wall.* . 248, 249
VAR. Rottleri *Prain* . . 249
VAR. typica . 248
insuave Hance . 233
javanicum *Benth.* 261
lucidum *Wall.* 263, 265
VAR. canescens *Prain* . . 263
VAR. typica . 263
lucidum Wall. . 262
macrophyllum Miq. . . 231
Mastersii *Benth.*. 268
melissæfolium Benth. . . 270
melissifolium *Wall.* . . 270
melissifolium Wall. . . 268
Gomphostemma *membranifolium* Miq. . . 231
microcalyx *Prain* . 251, 258
multiflorum Benth. 253
multiflorum Herb. Linn. Soc.. . 252
niveum *Hook. f.*. 250
nutans *Hook. f.* . 248
oblongum Miq. . 261
oblongum Moritzi 261
oblongum *Wall.* . 261, 265
VAR.? Helferi Hook. f. . 260
oblongum Wight 259
ovatum *Wall.* . 269
VAR. flaccida *Prain* . . 270
VAR. typica . 270
parviflorum Benth. . . 254
parviflorum H. f. & T. . . 261
parviflorum *Wall.* . 252, 258
VAR. farinosa *Prain* . . 253
VAR. typica . 252
pedunculatum *Benth.* . . 266
petiolare Miq. . 231
Philippinarum *Benth.* . 259
phlomoides *Benth.* . 264, 265
radicans Wall. . 269
rugosum *Prain* . 262
Scortechinii *Prain* 260
VAR.? Helferi *Prain* . . 260
VAR. typica . 260
strobilinum Benth. 245
Gomphostemma *strobilinum* *Wall.* . 246, 249
VAR. acaulis *Prain* . . 247
VAR. *elatius* *Benth.* . . 245
VAR. *Heyneana* Hook. f. . 248
VAR. typica . 246
VAR. viridis *Hook. f.* . 247
Thomsoni *Benth.* 251
velutinum *Benth.* 266
viride Wall. . 247
Wallichii *Prain* . 246
Hemsleyanum *Prain* . . 249; 243
Leonurus farinosus Ham. . . . 273
javanicus Blume . . 231
oblongifolius Blume . . 231
tomentosus Herb. Madr. . 259
Lucida *Prain* 259; 244
Melissifolia *Prain* . . . 268; 244
Microtœna cymosa *Prain* . . . 243
Niveum *Prain* 250; 243
Parviflora *Prain* . . . 251; 243
Pedunculata *Prain* . . . 265; 244
Phlomis javanica *Prain* . . . 231
oblongifolia *Prain* . . 231
rugosa *Benth.* . . . 231
? sp. *Benth.* 232
POGOSTEMON Prain . . . 245; 243
Prasiceæ *Benth.* 228
PRASIUM Blume 229
PRASIUM Roxb. 268
Prasium javanicum Blume . . 262
melissifolium Roxb. . . 270
phlomoides Reinw. . 264; 262
Stachys indica Wall. . . 249
indica Wight . . . 248
orientalis Rottler . . 249
tomentosa Heyne . . 248
STENOSTOMA Prain . . . 250; 243
Strobilina *Prain* . . . 245; 243

THE

SPECIES OF MYRISTICA

OF

BRITISH INDIA.

BY

GEORGE KING, M.B., LL.D., F.R.S., C.I.E.,

Superintendent of the Royal Botanic Garden, Calcutta.

CALCUTTA:

Printed at the Bengal Secretariat Press.

1891.

THE

SPECIES OF MYRISTICA

OF

BRITISH INDIA.

BY

GEORGE KING, M.B., LL.D., F.R.S., C.I.E.,

Superintendent of the Royal Botanic Garden, Calcutta.

THE SPECIES OF MYRISTICA OF BRITISH INDIA.

BY

GEORGE KING, M.B., LL.D., F.R.S., C.I.E.,

Superintendent of the Royal Botanic Garden, Calcutta.

The morphology of the genus *Myristica* has been so excellently discussed by the late Mr. Bentham (1); by Sir J. D. Hooker and the late Dr. T. Thomson (2); by MM. Alph. DeCandolle (3) and H. Baillon (4); and by Professor Prantl (5), that it seems superfluous to enter into an account of it here. But, as the present monograph of the British Indian species may fall into the hands of Forest Officers whose libraries are usually very limited, I venture to give a short account of it for their benefit. All the Nutmegs are either trees or bushes; some of them attaining great size, *e.g.*, *M. gigantea* and *M. magnifica;* while a few (*e.g.*, *M. fragrans*) rarely exceed thirty feet in height. The leaves are always simple, entire, exstipulate, alternate, feather-nerved, and very often aromatic—at least when bruised—the fragrant principle being in some species contained in special glands situated within the tissues of the leaf. The flowers are generally small, and they are invariably unisexual—usually diœcious, but in one species at least (*M. canarioides*) monœcious. The male flowers are variously arranged in axillary or supra-axillary fascicles, racemes, umbels, panicles, or cymes; and the inflorescence is often bracteate. The male flowers are produced in much larger numbers

(1) Hooker's *Journal of Botany* for 1853, p. 1.
(2) *Flora Indica*, by Hooker and Thomson, vol. I, 1855.
(3) *Ann. des Sciences Naturelles*, Ser. IV, vol. IV, p. 20.
(4) *Histoire des Plantes*, II, 498.
(5) *Die Natürlich Pflanzenfamilien, von Engler und Prantl.*

than the females; and as a fact the latter are usually very scantily represented in most collections. In the flowers of both sexes the perianth is single, coriaceous, more or less globose or urceolate or tubular; usually 3-toothed, but in some species 2- or even 4-toothed; the æstivation of the teeth being always valvate. The anthers, which are in shape either ovate or linear, have two parallel cells, and they are invariably collected on a central column, which may be stalked or sessile, and to which they are attached in one of two ways. In the majority of the species the column is cylindric or angled. It may be not much longer than broad, or it may be much elongated; but the anthers are always attached to it by their backs, through their connectives, the edges and, sometimes, the apices of the anther-cells being free. In some species the anthers are also united to each other, as well as to the column. In the section *Knema*, however, the column is cylindric below; but at its apex it expands into a flat, concave or slightly convex, orbicular (or somewhat 3-cornered) disc, to the edges of which disc the anthers are attached by their bases, either directly or by the intervention of short filaments. In some species the connective of each anther is prolonged at the apex into a short, free point; in others the projecting connectives of all the anthers of a flower are conjoined into a single conical appendage; while, in a third set, the connective is not prolonged at all. In all cases the dehiscence of the anther-cells is longitudinal, and it is invariably extrorse, *i.e.*, the pollen escapes outwards, or (in many of the *Knemas*) downwards. In number, the anthers of the Asiatic species vary from six to eighteen; but in one species (*M. bivalvis*) they number thirty, and in another (*M. Curtisii*) forty-five. Many of the South American species have, however, only three anthers, and these alternate with the lobes of the perianth. As will be understood from the preceding account of the anthers, there is considerable diversity in their arrangement. And these differences, together with the nature of the inflorescence in which the male flowers are disposed, and the presence or absence of bracteoles, have been taken as characters for the division of the genus into groups or sections.

The female flowers are, in all the species known to me, fewer in number and larger in size than the males. As a rule they present less variety than the males. The perianth is more inflated than that of the male; it is sometimes campanulate with a constricted mouth; it is also thicker in texture, and has shorter teeth than that of the male. I have only in one species found any trace of staminodes in a female flower. The ovary is single, usually sessile, more or less ovoid; it is invariably one-celled with a single, basal, anatropous ovule. The style is either very short or quite absent, and the stigma is flattish and slightly divided or lobed. The ripe fruit has a pericarp which often tends to split up, when ripe, into two valves; it is often succulent and brightly coloured. The solitary seed is invariably covered, more or less completely, by a usually laciniate, but sometimes entire, brightly coloured, fleshy or membranous, often aromatic, arillus. The exact nature of this arillus has been much discussed; some observers regarding it as an arillus proper, proceeding from the funiculus at or just below the hilum; others, as an arillode originating around the micropyle; while a third set believe it to originate from both hilum and micropyle. As in the seeds of *Myristica* the hilum and micropyle are approximated, the third view is probably the right one. The testa of the seed is smooth and hard; the albumen copious, ruminate, and often aromatic. The embryo is small, basilar and straight; the cotyledons being sub-foliaceous, divaricate, and flat or rugulose-plaited. The radicle is short, cylindric, and inferior.

The genus *Myristica* was founded by Linnæus in the second edition of his *Genera Plantarum*, published in 1742, the single species known to him being the Nutmeg of commerce. The genus was omitted in the third edition; but the Nutmeg reappeared in the younger Linnæus's supplement as a newly-described species. Gærtner, in his Treatise *De Fructibus et Seminibus Plantarum* (published in 1788), described and figured, from material which he probably obtained from Ceylon, the common Nutmeg and three species besides, viz., *M. dactyloides*, *M. Irya*, and *M. Iryaghedhi*. Gærtner's *M. Irya*, readily identified by its almost perfectly globular seeds, stands as a species to the present day. His *M. Iryaghedhi* I believe to be *M. Horsfieldii*, Bl.; and his *M. dactyloides* (and in this I am at one with Dr. Trimen, F.R.S., the present Director of the Peradeniya Botanic Garden) to be *M. laurifolia*, H. f. & Th. The next writer who added much to our knowledge of the Asiatic species was Blume, who, in his *Bijdragen* (published in 1825), gave an account of seven species, in addition to the common Nutmeg. In the first volume of his *Rumphia* (published in 1835), the same author added five more novelties, and also re-described four previously known species. In their *Flora Indica* (published in 1855), Drs. J. D. Hooker and T. Thomson made the next great addition to our knowledge of Asiatic Nutmegs. In that admirable fragment, twenty-three species of *Myristica* were described, of which a very large proportion were quite new. A little later (1856-57) there appeared (in his *Prodromus*) M. Alph. DeCandolle's excellent monograph of the whole order. Of the eighty-one species therein described, one is African; twenty-eight (viz., the entire sections *Virola*, *Sychoneura*, *Otoba*, *Compsoneura* and *Iryanthera*) are South American; one is Australian; five are Polynesian; one is doubtful, and forty-five are Asiatic. Miquel contributed largely to the literature of the genus. In 1859 appeared the first volume of his *Flora of Netherlands India*, in which he describes fifty-eight species (of which, however, three are non-Asiatic), and of these nine are new. In his Supplement for Sumatra (1860), the same author contributed five additional species from that island. And in his *Annals of the Leiden Herbarium* (*Ann. Mus. Lugd. Bat.*, vol. I, 205, 1863-64; and vol. II, 46, 1865-66) he adds eleven new species from Malayan countries. These bring the number of Asiatic species recognized by Miquel up to sixty-nine—a number which, from Miquel's inveterate habit of founding new species on imperfect materials, is doubtless capable of considerable reduction. In vol. III of their *Genera Plantarum* (1880), the late Mr. Bentham and Sir Joseph Hooker estimate the total number of species at about eighty, of which about fifty are Asiatic. Sir Joseph Hooker's *Flora of British India* contains the most recent account of the Indian species, and in that work thirty-two species (30 in the text and 2 in the appendix) are described; while several more are alluded to, but (for want of full material) are not named. The activity which has characterised the work of botanical collecting within the sphere of influence of the Calcutta Botanic Garden during the past few years, brought to the Calcutta Herbarium specimens of several species which I believed to be new. And the desirability of describing these, joined to the difficulty which all who are not botanical experts have in distinguishing *any* species of *Myristica*, suggested the idea of publishing figures, accompanied by descriptions, of all the British Indian species known at the present date. It was at Sir Joseph Hooker's suggestion that I undertook the present memoir, and during its elaboration I have had the benefit of his most kind and invaluable advice and encouragement. To prevent misunderstanding, I may explain that, by the phrase *British India*, I understand

political British India (including the Nicobar and Andaman Islands), and the provinces of the Malay Peninsula which, together with the islands of Singapore and Penang, are administered by the Government of the Straits Settlements.

By Adanson, *Myristica* was regarded as part of the family of *Pistachiers*, and by Jussieu it was considered to be part of the *Lauracées*. Robert Brown was the first to recognize that, for the genus, ordinal rank is necessary; and he placed his order *Myristiceæ* between *Proteaceæ* and *Laurineæ*, believing, however, that it is not closely allied to either. This is pretty much the position assigned to the family by the late Mr. Bentham and Sir Joseph Hooker, who, in their *Genera Plantarum*, place the family with *Piperaceæ* and *Monimiaceæ* in a group next to that which contains *Laurineæ*, *Proteaceæ*, and *Thymeleaceæ*. M. DeCandolle, however, in his *Prodromus*, places *Myristiceæ* between *Polygonaceæ* and *Proteaceæ*. Besides the similarity in leaf-type and in habit, the affinity with *Laurineæ* lies in the unisexual apetalous flowers. There is no doubt that (as Endlicher, Lindley, Sir Joseph Hooker, and Dr. T. Thomson pointed out) there is an alliance with *Anonaceæ* on account of the trimerous, valvate perianth; extrorse anthers; apocarpous fruit; ruminate albumen, and minute embryo. And, in their *Flora Indica*, Messrs. Hooker and Thomson actually put *Myristiceæ* next to *Anonaceæ*. There appears to me to be little doubt that the Anonaceous genus *Stelechocarpus* also affords a connecting link, not only by its diœcious flowers, but by its dotted aromatic leaves. Nutmegs, however, differ from Anonads in the great development of the arillus in their seeds, and in their unisexual flowers. In the *Flora of British India* Sir Joseph Hooker, however, gives the order a place near *Laurineæ*. In Lindley's opinion, *Myristiceæ* are, however, more closely allied to *Menispermaceæ* than to any other family; and so impressed was he with this view that he placed the two orders in his Menispermal alliance (along with *Monimiaceæ*, *Schizandreæ* and two other small families) at a considerable distance from his Ranal Alliance, which includes *Anonaceæ*; his chief argument for this arrangement being the unisexual character and trimerous symmetry of the flowers. Against this view of Lindley's there is to be urged the total difference of habit between Nutmegs and Menisperms; the universal occurrence of ruminate albumen in the seeds of the former, whereas in many of the latter albumen is totally absent, and when present it is only occasionally ruminate; the seeds of *Menispermaceæ*, moreover, have no arillus. By the majority of botanists the *Myristiceæ* are regarded as belonging to the single genus *Myristica*. But, within the genus, there is no doubt considerable variety of form, and the species arrange themselves into various, more or less natural, groups or sections. The first author to recognize this was Loureiro, who in 1790 published his genus *Knema*. Blume is responsible for the section *Pyrrhosa* (*Rumphia* i. 190); while he adopted Loureiro's genus *Knema* as a section, and grouped the remaining species in the section *Myristica proper*. Messrs. Hooker and Thomson, in their masterly account of the Indian species in their *Flora Indica*, added to the three sections recognized by Blume that of *Irya*; while M. DeCandolle, in treating of the species of the whole world, increased the total number of sections in the genus to thirteen. Only seven of these sections, however, contain Asiatic species; the members of five being, as has already been mentioned, entirely American, and the solitary member of the other being African (from Madagascar). In the *Genera Plantarum* of the late Mr. Bentham and Sir Joseph Hooker only seven sections are admitted for the species of the whole world, and of these two include purely American species.

Wherever it occurs the genus is a tropical one; but I feel convinced that many species remain still to be discovered, and I consider it would be premature to attempt to trace the geographical distribution of the known species more minutely than has already been incidentally done.

I have not found *Myristica* an easy genus. The difficulties that beset the student of it are of two sorts—natural and adventitious. Chief amongst the former sort are the dicœcious arrangement of the flowers; the scantiness of the female flowers; the succulence of the fruit, which makes its preservation in good condition for examination an uncommon occurrence; and finally the similarity in the form and texture of the leaves of species not very closely allied in other respects. The adventitious difficulties lie in the brief and insufficient accounts of their species given by all the earlier writers, and in the loose, though often lengthy, descriptions (often founded on the most imperfect materials) of the numerous species of which the late Professor Miquel is the author. I have little doubt I have blundered sadly in the account of the British Indian species which I now venture to publish. I would have blundered much more had it not been for the help of Sir Joseph Hooker, whose kindness I have acknowledged above. To my friend and colleague Dr. D. Prain I am also beholden for many sagacious suggestions, and to his pencil I owe the drawings of the analyses of the flowers of most of the species. Dr. Boerlage, Conservator of the Royal Herbarium, Leiden, has, in the most friendly way, compared for me most of my new species with the type specimens of Blume and Miquel which are deposited, respectively, in the collections at Leiden and Utrecht, and to him my warmest thanks are also due. My best acknowledgments are also due to Dr. H. Trimen, F.R.S., Director of the Botanic Garden, Peradeniya, Ceylon, who gave me much information about the Ceylon species, lent me his Herbarium specimens and drawings, and permitted me to copy several of the latter. To Mr. H. M. Ridley, F.L.S., Director of the Botanic Garden, Singapore, I am indebted for much invaluable material, and for the loan of the suite of specimens belonging to the Singapore Herbarium. Dr. M. Lawson, Director of the Botanical Department, Madras, also was kind enough to lend me the only specimens which I have ever seen of *Myristica magnifica*, Beddome.

I ought perhaps to explain that, in the measurements given in the following pages, the length of the leaf means the length of its blade only, the measurement of the petiole being given separately; that the breadth of a leaf is taken at its broadest part; and that by "androecium" I mean to include the staminal column as well as the anthers.

MYRISTICA, Linn.

Diœcious trees or shrubs; with evergreen, simple, alternate, ex-stipulate, penni-nerved, sometimes pellucid-punctate leaves. *Flowers* small, regular; the males in axillary or supra-axillary, often bracteate, cymes, fascicles, umbels, or panicles, rarely in racemes; the individual flowers sometimes bracteolate. *Perianth* gamophyllous, single, inferior, coriaceous, deciduous, usually 3-lobed, sometimes 2 or 4-lobed; the æstivation valvate. *Male* flower; anthers 3 to 18 (or even 30 or 45), 2-celled, ovate or linear, usually sessile; attached by their backs to a central, vertical, cylindric or angled, sessile or stalked column; free from each other or connate; or (sect. *Knema*) attached by their bases, either with or without short filaments, to the edges of a peltate stipitate disc; always extrorse; rudimentary pistil none. *Female* flower without staminodes (except in No. 16). *Ovary* sessile in the fundus of the perianth, free, 1-celled. *Stigma* usually sessile (rarely with a short style), capitate or depressed, sometimes lobed. *Ovule* solitary, basal, erect, anatropous. *Fruit* more or less fleshy, often splitting into 2, sometimes into 4, valves. *Seed* erect; arillus fleshy or membranous, entire, lobed, or laciniate and often induplicate at the apex; usually coloured and often aromatic; testa usually thick; albumen copious, hard, ruminate. *Embryo* very small, next the hilum; cotyledons divaricate, flat or crumpled; radicle short, inferior.

Sect. I.—Eumyristica (*Eumyristica*, Hook. fil. & Thoms.; *Eumyristica* and *Caloncura*, A. DC.) Male flowers in cymes, umbels or few-flowered panicles; perianth 3-toothed (4-toothed in *M. Ceylanica*) with a persistent, usually oblique, bracteole at its base; androecium more or less cylindric or fusiform; staminal column elongate, usually stalked; anthers linear, elongate, usually entirely connate to the column and to each other; occasionally their apices, and more rarely their edges free. *Fruit* large, ovoid, or oblong; the pericarp succulent, rarely leathery.

Male flowers in panicles 4 or 5 in. long; flowers and bracteoles large; leaves 10 to 16 in. long; fruit large . . . . . 1. *M. bracteata.*

Male flowers in lax little-branched panicles, 3 in. long (several times longer than the leaf-petioles); flowers small; leaves 8 to 10 in. long . . . . . 2. *M. Malaccensis.*

Male flowers in lax, branching cymes (at least twice as long as the leaf-petioles); leaves small; fruit large.

Fruit glabrous, broadly pyriform . . . . . 3. *M. fragrans.*
Fruit rufous-tomentose, elongate-oblong; cymes puberulous . . 4. *M. Malabarica.*
Fruit broadly ovoid; cymes rusty-pubescent . . . . . 5. *M. gigantea.*

Male flowers in condensed many-flowered umbels or cymes shorter or very little longer than the leaf-petioles.

Pericarp of fruit leathery, not succulent; male perianth 4-toothed . . . . . 6. *M. Ceylanica.*

Pericarp succulent.

Male flowers ovoid or globose.

Fruit minutely rufous-tomentose or pubescent, not rugulose.

Leaves elliptic to oblong-elliptic, rounded or truncate or slightly cuneate at the base; fruit ovoid, abruptly and shortly apiculate . . . . 7. *M. laurifolia.*

Leaves elliptic-lanceolate, oblong or elliptic, rounded or suddenly cuneate at the base; fruit sub-globular, 2·25 in. in diam. . . . . 8. *M. Beddomei.*

Leaves oblong or elliptic-oblong, rounded at the base, 12 to 24 in. long, stellate-tomentose beneath; fruit ovoid, 3 to 4 in. long . . . 9. *M. magnifica.*

Leaves oblong-lanceolate with rounded bases, 4 to 7 in. long, cinnamoneous-tomentose beneath; fruit 3 to 3·5 in. long . . . . . 10. *M. cinnamonea.*

Leaves oblong or elliptic-oblong, much cuneate at the base, 7 to 12 in. long, glabrous beneath; fruit 1·5 to 3 in. long . . . . . 11. *M. crassa.*

Fruit rugulose, densely woolly rufous-tomentose . . 12. *M. Lowiana.*

Fruit glabrous.

Leaves linear-oblong . . . . . 13. *M. Maingayi.*
Leaves ovate-elliptic or elliptic . . . . . 14. *M. Andamanica.*

Male flowers elongate, narrowly tubular; fruit gibbous, glabrous . . . . . 15. *M. elliptica.*

Male flowers on short, woody, few-flowered axillary racemes . . 16. *M. suavis.*

Sub-sect. Horsfieldia (*A. DC.*) Male flowers minute, mixed with sub-persistent bracteoles, in many-flowered glomeruli on large, open, branching panicles; androecium and fruit as in *Eumyristica* . . . 17. *M. Horsfieldii.*

Sect. II.—Pyrrhosa (*Pyrrhosa*, Blume, Hook. fil. & Th., & A. DC.) Male flowers minute, in many-flowered, branching, often large and spreading panicles; perianth ebracteolate, usually 3 sometimes 4-toothed; androecium short, sub-globular or 3-gonous, rarely cylindric, usually sessile; anthers not elongate, completely attached to the column by their backs, their apices sometimes free for a short way. *Fruit*

globose or ovoid-globose, the pericarp usually leathery and but little succulent, (succulent in *M. superba*).

Androecium cylindric.

Anthers about 10, quite connate; leaves 5 to 6·5 in. long . . 18. *M. fulva.*
Anthers about 9, with free apices; leaves 10 to 12 in. long . . 19. *M. Murtoni.*
Anthers about 18, with free apices; leaves 9 to 12 in. long . . 20. *M. ferruginea.*
Androecium ovoid, obtuse; flowers large; stamens 20 . . . . . 21. *M. superba.*
Androecium depressed-globose, shortly stalked . . . . . 22. *M. Prainii.*
Androecium depressed-globose, sessile.
Leaves glabrous.
Male flowers large (·13 in. in diam.); fruit 1·5 to 1·75 in. long; arillus entire . . . . . 23. *M. Kingii.*
Male flowers under ·1 in. in diam.; fruit 1·5 in. long; arillus laciniate at the apex . . . . . 24. *M. myristica.*
Male flowers ·1 in. in diam.; fruit 2·5 to 3 in. long; arillus slightly laciniate at the apex . . . . . 25. *M. sucosa.*
Leaves rusty-tomentose, especially beneath.
Leaves glabrescent when old; 6 to 10 in. long; male panicles 2·5 to 4 in. long . . . . . 26. *M. tomentosa.*
Leaves persistently tomentose; more than 10 in. long.
Male panicles 6 to 9 in. long, their branches long and slender.
♂ flowers very small (·05 in. long), globular, glabrous, crowded; their pedicels short . . . . 27. *M. rubiginosa.*
♂ flowers ·1 in. long; their pedicels two or three times as long . . . . . 28. *M. floccalosa.*
Male panicles 4 to 12 in. long; their branches short, very stout.
♂ flowers ·1 in. long, on very short tomentose pedicels, or sub-sessile; perianth of ♀ flower sub-accrescent and persistent at base of fruit . . 29. *M. Wallichii.*
Monœcious: the ♀ panicles much longer than the male . . . . . 30. *M. camptoides.*

Sect. III.—Gymnacranthera (*A. DC.*) Panicles as in *Pyrrhosa*, but short; perianth ebracteolate, 3-toothed; androecium shortly cylindric, or sub-quadrangular and truncate, sessile; anthers connate to the column by their connectives only, their margins and apices quite free; stigma sessile, 2-lobed; leaves and fruit small.

Flowers globular in bud . . . . . 31. *M. Griffithii.*
Flowers ovoid in bud.
Leaves 3 to 6 in. long, with 6 to 10 pairs of very indistinct nerves; fruit ovoid . . . . . 32. *M. Farquhariana.*
Leaves 6 to 10 in. long, with 13 to 17 pairs of nerves; fruit narrowly obovoid or ellipsoid . . . . . 33. *M. Forbesii.*
Leaves 6 to 12 in. long, with 11 to 13 pairs of distinct nerves; fruit globose . . . . . 34. *M. Canarica.*

Sect. IV.—Irya (*Hook. fil. & Thoms. & A. DC.*) Panicles as in *Pyrrhosa;* perianth bifid or 3-toothed, sometimes 4-toothed; androecium globose or depressed-globose, sessile, sometimes elongated transversely; anthers for the most part attached to the column by their bases only (quite connate to it in *M. bivalvis*), their sides and apices quite free; the apices sometimes much incurved. *Fruit* as in *Pyrrhosa.*

Perianth of ♂ flowers bi-valved, never 3 or 4-toothed.

Androecium a sessile cup, bearing about 30 elongate, connate, much inflexed anthers . . . . . 35. *M. bivalvis.*

Androecium elongated transversely, with 10 anthers partially attached to the column and to each other . . . . . 36. *M. crassifolia.*

Androecium slightly elongated transversely; anthers 10, their tips incurved; ♂ panicles rufous-pubescent; fruit globular . . 37. *M. Irya.*

Perianth of ♂ flowers 2 or 3-toothed; androecium ovate or subglobular; anthers about 10; ♂ panicles and all other parts glabrous; fruit ovoid . . . . . 38. *M. glabra.*

Perianth usually 3-toothed; sometimes 4-toothed.

Leaves glabrous.

♂ panicles rather few-flowered, scurfy, stout, 3·5 in. long; ♂ fl. ·1 in. long; fruit 1·75 in. long; young branches terete . . . . . 39. *M. majuscula.*

♂ panicles many-flowered, 4 to 6 in. long, slender, spreading, glabrescent; ♂ fls. about ·05 in. in diam.; fruit 1·25 in. long; young branches distinctly 2-ridged . . . 40. *M. brachiata.*

♂ panicles scurfy or almost glabrous, not more than 2 in. long; ♂ fls. ·05 in. in diam.; female panicles under ·75 in. long . . . . . 41. *M. Ridleyana.*

♂ panicles many-flowered, 2·5 to 3·5 in. long, nearly glabrous; ♂ fl. less than ·05 in. in diam.; fruit 1·25 to 1·5 in. long . . . . . 43. *M. Collettiana.*

Leaves glabrous, except the lower surface of the midrib in young leaves.

♂ panicles many-flowered, 2 to 4 in. long; rusty-tomentose, spreading; ♂ fl. ·05 in. in diam.; female panicles 1·5 in. long; fruit ·75 in. long . . . . . 42. *M. polyspherula.*

Sect. V.—Knema (*Blume, H. f. & Th., & A. DC.*) Male flowers pedicelled, in clusters of from 3 to 15 from short axillary tubercles; pedicels with a persistent bracteole about the middle (close to the perianth in *M. Cantleyi* and *M. oblongifolia*). Staminal column peltate, concave or flat, rarely convex, usually stalked; the anthers ovate, usually sessile, attached by their bases to its edge, or sometimes with short filaments; otherwise free, radiating more or less horizontally from the edge of the flattened column and dehiscing downwards, or sub-erect and extrorse.

Staminal disc and anthers almost as in *Irya*; bracteole close to the flower . . . . . 44. *M. oblongifolia.*

Anthers with filaments.

Disc flat or sub-concave.

Leaves less than 10 in. long.

Fruit broadly ovoid, apiculate, ·5 to ·75 in. long; arillus laciniate at its apex; anthers 9 to 12 . . . . . 45. *M. Kunstleri.*

Fruit ovoid, blunt, 1·5 in. long; arillus laciniate at the apex; anthers 15 . . . . . 46. *M. conferta.*

Fruit oblong, not pointed, 1 to 1·75 in. long, always glabrescent; arillus entire . . . . . 47. *M. Wrayi.*

Fruit pointed at each end, 1 to 1·5 in. long, furfuraceous-tomentose when young, glabrescent only when old; arillus entire. . . . . 48. *M. attenuata.*

Leaves more than 10 in. long . . . . . 49. *M. Scortechinii.*

Disc convex . . . . . 50. *M. interrupta.*

Anthers sub-sessile; staminal disc large, flat, or sub-concave . . 51. *M. perforatea.*

Anthers sessile, sub-erect; staminal disc small, concave.

Fruit ·75 to 1·2 in. long, densely and harshly rufous-tomentose . 52. *M. laurina.*

Fruit ·75 to 1·25 in. long; glabrous when old . . . . . 53. *M. glauca.*

Anthers sessile (sub-sessile in *M. Cantleyi*), horizontal.

Disc flat or concave.

Anthers 11, or fewer.

Fruit spherical . . . . . 54. *M. Miquelii.*

Fruit oblong, gibbous . . . . . 55. *M. gibbosa.*

Fruit oblong, not gibbous.

Fruit ·75 to 1 in. long; stigma not persistent; arillus entire . . . . . 56. *M. geminata.*

Fruit ·5 in. long; stigma persistent; arillus fimbriate at apex . . . . . 57. *M. glaucescens.*

Anthers 14 to 18.

Leaves under 10 in. long . . . . . 58. *M. erratica.*

Leaves 10 to 20 in. long.

Ripe fruit blunt, densely covered with coarse, short, rusty tomentum . . . . . 59. *M. longifolia.*

Ripe fruit pointed at each end; glabrous . . . 60. *M. Clarkeana.*

Ripe fruit 2 to 3 in. long, thickly coated with silky wool . . . . . 61. *M. Hookeriana.*

Anthers 45 . . . . . 62. *M. Curtisii.*

Disc convex (mammillate).

Perianth of ♀ flower accrescent, and persistent at the base of the fruit; anthers with short filaments . . . . . 63. *M. Cantleyi.*

Imperfectly known species of which the position is uncertain.

Fruit in long, lax panicles, ellipsoid; leaves oblong to oblong-lanceolate, 10 to 12 in. long. *Evidently a Pyrrhosa or an Irya* .	64. *M. exaltata.*
Fruit in long panicles like the last, ovoid, slightly oblique; leaves elliptic to elliptic-oblong, 6 to 8 in. long. *Evidently closely allied to M. exaltata*	65. *M. racemosa.*
Female perianth sub-accrescent and persistent at base of fruit; fruit ovoid; leaves oblong-lanceolate, tapering to each end, glabrous. *Probably a Pyrrhosa near M. Wallichii*	66. *M. paludicola.*
Leaves narrowly oblong, much elongate; petiole short, winged. *Probably a Pyrrhosa*	67. *M. pendulina.*
Fruit gibbous at one side, apiculate; arillus very short and much fimbriate; leaves oblong-elliptic, blunt or retuse, felted and pale underneath. *A Knema, probably near M. oblongifolia*	68. *M. retusa.*

Sect. I.—Eumyristica (*Eumyristica*, Hook. fil. & Th.; *Eumyristica* and *Caloneura*, A. DC.) *Male flowers* in cymes, umbels or few-flowered panicles; *perianth* 3-toothed (4-toothed in *M. Ceylanica*), with a persistent, usually oblique, bracteole at its base. *Andrœcium* more or less cylindric or fusiform; *staminal column* elongate, usually stalked; *anthers* linear, elongate, usually entirely connate to the column and to each other; occasionally their apices, and more rarely their edges, free. *Fruit* large, ovoid or oblong; the pericarp succulent, rarely leathery.

1. Myristica bracteata, *A. DC. Prod.* xiv. 1, 192. A tree 80 to 100 feet high, glabrous, except the under surfaces of the midribs and nerves of the leaves and the panicles. *Leaves* large, coriaceous, oblong, sometimes slightly obovate, shortly and rather abruptly acuminate; the base rounded or sub-truncate, often emarginate, rarely cuneate; upper surface shining, the lower pale, glaucous, minutely adpressed-lepidote when young; the nerves 20 to 30 pairs, spreading or sub-horizontal, interarching within the edge, prominent beneath, scaly when young, but ultimately glabrous; the midrib very stout; length 10 to 16 in., breadth 4 to 6 in.; petiole 1 to 1·25 in. *Male panicles* axillary, or from the axils of fallen leaves, long-stalked, spreading, trichotomous, few-flowered, the branches opposite, 4 to 6 in. long; *flowers* globular, ·25 in. in diam.; pedicels slender, scaly, ·25 to ·5 in. long; bracteole semi-annular to sub-orbicular, embracing half the base of the flower; *perianth* leathery, scaly-tomentose outside, glabrous within, urceolate, the mouth gaping, with 3 broadly triangular, sub-acute teeth; *andrœcium* on a short, thin stalk, expanded at the base, cylindric, sub-apiculate, nearly as long as the perianth; anthers 12 to 18, narrowly elongate. *Female flower* unknown. *Fruit* ellipsoid or oblong when ripe, blunt at the apex, slightly narrowed at the base, minutely rufous-pubescent, sub-furfuraceous, 3 to 3·5 in. long by 1·5 to 2 in. in diam.; pericarp thickly coriaceous; arillus thin, fleshy, extending to the apex of the seed, laciniate and areolate; *seed* shining. *Wall. Cat.* 6800, *A. & B.*

Perak: at low elevations on the hills. *King's Collector* Nos. 5513 & 6960; *Scortechini* No. 1872.

Specimens of this plant were distributed by Wallich as No. 6800 of his catalogue. These were derived partly from trees grown in the Botanic Garden, Calcutta (where they were reputed to have been received from the Mauritius), and from the

Mauritius, where the tree was reported to be indigenous. But it is now found that no *Myristica* is indigenous to the Mauritius, and no species is described in Baker's Flora of that island and of the Seychelles. There is, however, wild in the lower hill forests of Perak a species, specimens of which agree with Wallich's No. 6800. It appears therefore probable that the Wallichian specimens were derived from the Straits and not from Mauritius. M. DeCandolle refers to this species specimens collected by Cuming in the Philippines, but I have not seen these.

Plate 106. Myristica bracteata, *A. DC.* 1, Branch with panicle of male flowers—*of natural size;* 2, male flower; 3, male flower—*dissected;* 4, androecium—*enlarged.*

Plate 107. Myristica bracteata, *A. DC.* 1, Branch with ripe fruit; 2, section of ripe fruit showing seed and its arillus—*of natural size.*

2. Myristica Malaccensis, *Hook. fil. Fl. Br. Ind.* v. 104. A glabrous tree; young branches rather slender. *Leaves* oblong or oblong-elliptic, acute or acuminate, usually rounded but sometimes acute at the base; main nerves 15 to 20 pairs; length 8 to 10 in.; petiole ·35 to ·5 in. *Male panicles* solitary, from the axils of leaves or of fallen leaves, 3 to 4 in. long, slender; *flowers* ·1 in. long, on filiform pedicels twice as long as themselves, in sub-cymose clusters; bracteoles large, reniform, membranous, glabrous with ciliate edges; *perianth* sub-globose, sub-inflated, very coriaceous, glabrous, its apex with 3 broad, blunt, shallow teeth; *androecium* much shorter than the perianth, broad, sub-truncate, almost sessile; anthers about 7; their tips free, sub-acute. *Fruit* unknown.

Malacca: *Maingay* (*Kew Distrib.* 1305).

Known only by Dr. Maingay's scanty specimens.

Plate 107 *bis.* Myristica Malaccensis, *Hook. fil.* 1, Branch with male panicles; 2 & 3, leaves and male panicles from other specimens—*of natural size;* 4, male flower; 5, androecium; 6, bracteole—*enlarged.* (*Drawn, through the courtesy of Mr. W. Thiselton Dyer,* F.R.S., *from Maingay's original specimen in the Kew Herbarium.*)

3. Myristica fragrans, *Houtt. Hist. Nat.* ii. 3, 233. A considerable tree; all parts, except the ovary and young fruit, glabrous; young branches slender, brownish. *Leaves* thinly coriaceous, elliptic-oblong, lanceolate or elliptic; the apex shortly acuminate, the base cuneate; upper surface shining; the lower dull, pale, sub-glaucous; main nerves 8 to 10 pairs impressed above, prominent beneath, spreading; length 2·5 to 5 in., breadth 1·5 to 2·25 in.; petiole ·4 to ·6 in., slender. *Male flowers* in slender, long, pedunculate, slightly supra-axillary umbellate cymes, ·75 to 1·25 in. long. *Perianth* ·2 in. long, ellipsoid, sub-urceolate, glabrous; teeth short, triangular; bracteole ovate, quickly deciduous and leaving an oblique, wavy, incomplete annulus; pedicels slender, ·25 to ·5 in. *Andrœcium* cylindric-ellipsoid, hardly apiculate, its stalk a third of its length, ridged, glabrous; stamens about 12, narrow. *Female flowers* larger than the males and in fewer-flowered umbels; *perianth* ·35 in. long, glabrescent, urceolate; the teeth short, reflexed; *ovary* sessile, cylindric-ellipsoid, tapering slightly upwards; tawny-villous; stigmas 2, flat, broad, fleshy. *Fruit* broadly pyriform, sometimes apiculate, 2·5 to 3 in. long and nearly as broad, glabrous; pericarp succulent; *seed* broadly ovoid, areolate, striate, embraced to the apex by the red, fleshy, much laciniate arillus. *Hook. fil. Fl. Br. Ind.* v. 102; *A. DC. Prod.* xiv. 1, 189; *Miq. Fl. Ind. Bat.* i. *pt.* 2, 53; *Blume Rumphia* i. 180, *t.* 55. *Bentley & Trim. Med. Pl.* iii. *t.* 218. M. officinalis, *Linn. fil. Suppl.* 265; *Gærtn. Fruct.* i. 194, *t.* 41 (*excl. syn. Rumph.*); *Hook. Exot. Bot.*, *t.* 155, 156, & *Bot. Mag.*, *t.* 2756, 2757. M. moschata, *Thunbg. in Act. Holm.* 1782, *p.* 45;

Dissert., 1784, *p.* 83; *Dissert. de Myristica*, 1788, *p.* 3; *Willd. Sp.* iv. 2, *p.* 869; *Blume Bijdr.*, 575; *Roxb. Fl. Ind.* iii. 843. M. aromatica, *Lamk. Act. Paris*, 1788, *p.* 155, *t.* 5 to 7, & *Ill. Gen.*, *t.* 832; *Roxb. Corom. Pl.* iii. 267.

The Nutmeg of commerce is said to be indigenous only in the Eastern Moluccas; but, as it has been introduced and is cultivated in most of the provinces dealt with in this paper, I give a description and figure of it.

Plate 108. Myristica fragrans, *Houtt.* 1, Branch with male flowers; 2, twig with female flowers; 3, ripe fruit; 4, section of the same showing seed and arillus; 5, arillus (empty); 6, seed—*of natural size;* 7, male flower in section; 8, androecium; 9, ovary—*enlarged.*

4. Myristica Malabarica, *Lamk. in Act. Paris*, 1788, 162. A large tree; all parts, except the inflorescence, glabrous; young branches very thin, rather pale. *Leaves* thinly coriaceous, sometimes almost membranous, elliptic-lanceolate or narrowly oblong, sub-acute at either end; upper surface shining, the lower dull, not paler than the upper when dry; main nerves 8 to 14 pairs, thin and indistinct on both surfaces, the midrib stout; length 4 to 6 in., breadth 1·25 to 2·25 in.; petiole about ·5 in., slender. *Male flowers* in slender, open, di- or tri-chotomous, axillary or supra-axillary umbellulate cymes, often nearly half as long as the leaves; buds ·2 in. long, ovoid-globose; pedicels ·25 to ·4 in. long, slender, puberulous; the bracteole semi-orbicular, minute, closely applied to the base of the flower at one side; *perianth* minutely scurfy, puberulous outside, glabrous within; its teeth short, triangular. *Andrœcium* apiculate; anthers 10 to 14, linear; stalk about a fourth of the length of the column, sub-globular, rufous-tomentose. *Female flowers* more globose and larger than the males and in simple, few-flowered, rather stout, axillary umbels not much longer than the petioles, pointed, ·25 in. in diam.; the bracteole forming a narrow, imperfect cup round the base of the flower; *ovary* sessile, ovoid-globose, pointed, densely rufous-tomentose; stigma large, sessile, 2-lobed. *Fruit* elongate-oblong, pointed, densely rufous-tomentose, 2 to 2·5 in. long and 1·25 in. in diam.; arillus (ex A. DC.) reddish-yellow, irregularly lobed and lacunose, extending to the apex of the seed; *seed* ovoid, obtuse, slightly flattened on one side; the testa shining. *Hook. fil. & Thoms. Fl. Ind.* 163; *Hook. fil. Fl. Br. Ind.* v. 103; *A. DC. in Prod.* xiv. 1, 194; *Dalz. & Gibs. Fl. Bomb.* 4; *Beddome Fl. Sylvat.*, *t.* 269. M. tomentosa, *Grah. Cat. Bomb. Pl.* 175 (*not of H. f. & T.*); M. dactyloides, *Wall. Cat.* 6786 (*not of Gærtn.*); M. notha, *Wall. Cat.* 6787.

Western coast of Peninsular India, from the Concan to Malabar, in the wet forests at the base of the hills; common.

Plate 109. Myristica Malabarica, *Lamk.* 1, Branch with male flowers; 2, twig with female flowers; 3, ripe fruit—*of natural size;* 4, male flower—*dissected;* 5, ovary from female flower of fig. 2—*enlarged.*

5. Myristica gigantea, *n. sp. King.* A tree 90 to 130 feet high; all parts, except the leaf-buds, apices of branches, inflorescence and fruit, glabrous; young branches thin, at first rusty-puberulous, afterwards glabrous and dark-coloured. *Leaves* small, coriaceous, glabrous, narrowly oblong-elliptic or linear-lanceolate, rather blunt (sometimes sub-acute) at either end, when dry the edges revolute; upper surface shining, pale when dry; lower dull, pale, sub-glaucous at first; nerves 12 to 18 pairs, sub-horizontal, faint, evanescent towards the margin; midrib bold beneath; length 3 to 4·25 in., breadth ·9 to 1·4 in.; petiole ·5 to ·75 in. *Male panicles* axillary or from the axils of fallen leaves, cymose,

rusty-pubescent, twice as long as the petioles; *perianth* ·15 in. long, ovoid, with short blunt or sub-acute teeth, rusty-tomentose outside, sub-glabrous inside; pedicel ·15 to ·2 in. long; bracteole narrowly semi-annular, embracing half the base of the perianth, tomentose. *Androecium* half the length of the perianth, cylindric, blunt; anthers linear, about 10, sometimes deficient in the lower third of the column; stalk about one-third of the length of the column, tomentose. *Female flowers* unknown. *Fruit* (immature) 1 in. long, solitary, on a thick woody pedicel ·5 to 1 in. long, broadly ovoid, slightly pointed, densely and minutely rufous-tomentose; arillus extending to the apex of the seed, thin, narrowly fimbriate to nearly the base; *seed* ovoid, shining.

Perak: at elevations under 1,000 feet. *Scortechini* No. 1949; *King's Collector* Nos. 5866 and 6050.

A very distinct species, distinguished by its small, narrow, glabrous, coriaceous leaves and condensed, many-flowered, minutely rufous-tomentose panicles of male flowers. It forms a larger tree than any of the species here described—hence its specific name. A closely allied species, but with glabrous, sub-obovoid, sub-gibbous fruit, contracted towards the base, occurs in New Guinea (Forbes, No. 710, in fruit only). Sir Joseph Hooker informs me that there is in the Kew Herbarium a leaf-specimen closely resembling this (Motley, No. 145), but it has neither flower nor fruit.

PLATE 110. Myristica gigantea, *King*. 1, Branch with male flowers; 2, branch with young fruit; 3, section of young fruit; 4, arillus; 5, young seed—*of natural size;* 6, male flower; 7, androecium—*enlarged*.

6. MYRISTICA CEYLANICA, *A. DC. in Ann. Sc. Nat. Ser.* 4, *vol.* 4, *p.* 29, *& Prod.* xiv. *pt.* 1, 190. A tree; all parts glabrous, except the leaf-buds, male and female inflorescence and fruit; young branches rather slender, dark-coloured, shining. *Leaves* coriaceous, narrowly elliptic-oblong to oblong-lanceolate, the apex sub-acute, the base cuneate, often much narrowed, never rounded, sometimes slightly unequal; upper surface very shining, the lower dull, rather darker in colour; main nerves about 12 to 14 pairs, very faint and depressed (when dry) on the upper surface, bolder below; all sub-ascending and slightly curving, interarching faintly inside the margin; length of blade 5·5 to 8 in., breadth 2 to 3 in.; petiole ·75 to 1·5 in. *Male flowers* in rusty, very short, stoutly pedunculate, woody, 6- to 12-flowered, axillary cymes; peduncles 25 in. long, lengthening slightly with age. *Flowers* on pedicels ·1 to ·2 in. long, the bracteole half-orbicular, covering part of the base of the perianth; *perianth* ·25 in. long, inflated-tubular, its teeth 4, broadly triangular, extending about a fourth of its length, rufous-tomentose outside and glabrous inside, as is the bracteole; *androecium* shorter than the perianth, cylindric, apiculate, its stalk from a fourth to a third of the length of the column; anthers 9 or 10, linear. *Female flowers* in axillary cymes, like the males, but fewer-flowered; the *perianth* with 3 spreading teeth. *Fruit* solitary or in pairs, axillary, shortly pedunculate, ellipsoid, sub-compressed, slightly ridged along one side, and sub-gibbous at the base; the apex narrowed, apiculate; length 2·5 in., diam. about 1·5 in.; pericarp covered with minute sub-deciduous, scurfy, rufous tomentum, thickly coriaceous, but not fleshy; peduncle thick, woody, ·5 in. long. *Seed* ellipsoid, depressedly striate, enveloped to the apex by the yellow, fleshy, laciniate arillus. *Thwaites Enum. Pl. Cey.* 11 & 399. M. laurifolia, *H. f. & Th.*, VAR. Ceylanica, *Hook. fil. Fl. Br. Ind.* v. 103.

Ceylon: at low elevations in moist forests, and often near the banks of rivers. *Thwaites C. P.* No. 2923.

This has been reduced by Sir Joseph Hooker (*F. B. I.* v. 103) to a variety of M. laurifolia, *Hook. fil. & Thoms.* But a careful examination of fresh specimens kindly collected for me by my friend Dr. H. Trimen, F.R.S., Director of the Botanical Garden at Peradeniya, makes me believe that it is really a distinct species. Its leaves are perfectly glabrous, and its fruit has a leathery pericarp; whereas in *M. laurifolia* the leaves are minutely lepidote-pubescent underneath, except when quite adult, and the pericarp is very succulent. Dr. Trimen informs me that this is rather a local species, occurring "both in the low country and in what I call the intermediate region, *i.e.*, intermediate between our moist and dry districts; whereas *M. laurifolia*, H. f. & Th., which it most closely resembles, is a moist country tree."

PLATE 111. Myristica Ceylanica, *A. DC.* 1, Twig with female flowers; 2, cluster of male flowers; 3, fruit dehiscing and showing the seed covered by its arillus—*of natural size;* 4, male flower; 5, androecium—*enlarged.*

7. MYRISTICA LAURIFOLIA, *Hook. fil. & Th. Fl. Ind.* 163. A tree; all parts glabrous, except very young leaf-buds and the inflorescence at all stages; young branches dark-coloured. *Leaves* coriaceous, elliptic to oblong-elliptic, obtuse or sub-acute, the base truncate, rounded or slightly cuneate; upper surface shining, lower dull, darker (when dry); main nerves, 12 to 14 pairs, depressed on the upper, rather prominent on the lower, surface, interarching freely, the secondary nerves almost as prominent but much shorter; length ·6 to ·9 in., breadth 2·5 to 4 in., petiole ·75 to 1 in. *Male flowers* in shortly pedunculate axillary cymes, shorter than the petioles when young, but often as long when old; pedicels shorter than the perianth, thick; bracteole orbicular-ovoid, embracing the lower part of the perianth at one side only; *perianth* nearly ·2 in. long, ovoid-tubular, sub-inflated, cut for a fourth of its length or less into 3 acute teeth, rufous-pubescent outside like the bracteole, glabrescent within; *androecium* thick, cylindric, apiculate, shorter than the perianth, its stalk thick, from half as long to as long as the column; anthers about 14, linear. *Fruit* shortly pedunculate, solitary, ovoid, with a short abrupt apiculus, rufous pulverulent, 1·5 to 2 in. long and 1·25 to 1·5 in. in diam.; pericarp slightly succulent; *seed* narrowly ovoid, covered to the apex by the deeply laciniate, fleshy, yellow arillus. M. laurifolia & M. diospyrifolia, *A. DC. Prod.* xiv. 1, 191; M. laurifolia, *Hook. fil. Fl. Br. Ind.* v. 103 (*in part*).

Ceylon: in moist forests from 1,000 to 4,000 feet. *Thwaites C. P.* No. 416, Trimen.

Dr. Trimen informs me that this is the most abundant species of *Myristica* in Ceylon, but that it occurs only in the moister parts of the island; whereas *M. Ceylanica* is found in parts intermediate, as regards moisture, between these and the dry northern districts. Its vernacular name is, Dr. Trimen says, "Malaboda," and its timber is largely used in making tea chests. He is of opinion that M. DeCandolle's *M. diospyrifolia* is not separable from *M. laurifolia*; and as a matter of fact it appears from DeC's description of the latter (*Prod. l. c.*) that he had seen no specimen of it, and that he merely quotes its description from *H. f. & Th.* (*Fl. Ind.* 163). Dr. Trimen believes that probably the oldest name for the species is *M. dactyloides* of Gærtner, whose figure (*Fruct et. Sem.* i. *t.* 41, *fig.* 2) agrees very well. But Gærtner probably included other species under the name.

PLATE 112. Myristica laurifolia, *Hook. fil. & Thoms.* 1, Branch with a dehiscing ripe fruit; 2, ripe fruit; 3, seed; 4, seed covered by its arillus; 5 & 6, sections of seed; 7, male inflorescence—*of natural size;* 8, male perianth; 9, androecium—*enlarged.* (*Nos.* 1 *to* 6 *are copied from a drawing made from fresh specimens kindly lent to me by Dr. Trimen,* F.R.S.)

8. MYRISTICA BEDDOMEI, *King.* A tall tree; all parts glabrous, except the under surfaces of the young leaves and the inflorescence at all stages; young branches rather slender, dark coloured. *Leaves* coriaceous, elliptic-lanceolate, oblong or elliptic, acute; the base rounded or suddenly cuneate; upper surface shining, lower dull, glaucous, the midrib very stout; the 13 to 17 pairs of main nerves spreading, rather bold at their bases, but faint towards their interarching apices; length 6 to 10 in., breadth 2·5 to 3·5 in., petiole ·8 to 1·25 in. *Male flowers* on stoutly pedunculate, woody, 8- to 20-flowered, axillary cymes; peduncles ·25 in., lengthening slightly with age; flowers on pedicels ·1 in. long, or sessile; the bracteole sub-orbicular, tomentose, oblique, embracing a large part of the flower on one side; *perianth* ·2 in., ovoid, with 3 broad triangular teeth, extending to about a third of its length, rufous-pubescent externally, glabrous within. *Androecium* shorter than the perianth, cylindric and bluntly apiculate; its stalk thick, grooved, varying with age from $\frac{1}{2}$ to $\frac{1}{4}$ the length of the column; anthers 9 or 10, linear. *Female flowers* in axillary cymes as in the males, but few-flowered; flowers sessile; *perianth* globular-urceolate, expanded below the 3 spreading ovate teeth, pubescent outside. *Ovary* sessile, globose, narrowed to the apex, adpressed-pubescent; stigma sessile, large, slightly oblique, sub-globose. *Fruit* solitary or in pairs, pedunculate, sub-globose, apiculate, grooved on one side along the suture, 2·25 in. in diam.; pericarp minutely rufous-pubescent, thick, succulent; peduncle ·25 in. long, very stout. *Seed* globose, smooth, 1·35 in. in diam.; the arillus extending to its apex, red, fleshy. M. laurifolia, *Beld. Fl. Sylvat.*, *t.* 267. *in part*; *Hook. fil. Fl. Br. Ind.* v. 103, *in part* (*excl. syn.* M. laurifolia, *H. f. & Th.*, *from both citations*).

Peninsular India; Western Ghâts from Canara to Travancore, from the base of the range to elevations of 5,000 feet.

This species has been included under *M. laurifolia* by Sir Joseph Hooker and Colonel Beddome. It appears to me, however, to differ so much from the Ceylon species to which H. f. & Th. originally gave that name, that I have ventured to form it into a species. The fruit of this is distinguished from the fruit both of *M. laurifolia*, H. f. & Th., and of *M. Ceylanica*, A. DC., by its more globular form and much more succulent pericarp, as well as by its leaves being glaucous underneath. Colonel Beddome's figure of *M. laurifolia* (*Fl. Sylv.*, *t.* 267) is a mixture of the fruit of this with the leaves and flowers of *M. Malabarica*, Lamk.

PLATE 118. Myristica Beddomei, *King.* 1, Branch with male flowers; 2, young fruit (in section); 3, ripe fruit; 4, seed covered by its arillus—*of natural size;* 5, male flower with bracteole; 6, androecium; 7, female flower; 8, ovary—*enlarged* (*Nos.* 3 *&* 4 *are copied from Beddome's Fl. Sylv.*, *t.* 267).

9. MYRISTICA MAGNIFICA, *Bedd. Fl. Sylv.*, *t.* 268. A tree 90 to 100 feet high: young branches stout, glabrous, the youngest deciduously rusty-pubescent. *Leaves* coriaceous, oblong to elliptic-oblong, acute or acuminate, the base rounded; upper

surface glabrous, shining, the midrib bold; lower covered by a dense layer of minute, stellate, rusty, deciduous tomentum; ultimately glabrous, pale and sub-glaucous; main nerves 20 to 26 pairs, spreading and interarching by the curving tips, prominent on the lower, impressed on the upper surface; midrib very stout on both surfaces; length 12 to 24 in., breadth 3·5 to 6 in.; petiole 1 in., stout, channelled. *Male flowers* in dense 8- to 15-flowered clusters from very short, woody, axillary tubercles; buds ovoid, their bases on one side embraced by the semi-orbicular, sericeous bracteole; pedicels ·1 in. long, or absent; *perianth* ·2 in. long, ovoid-globose, with 3 or 4 short sharp teeth, sericeous-tomentose externally, glabrous internally. *Andrœcium* much shorter than the perianth, with a short hairy stalk, ovate-cylindric, bluntly apiculate; anthers about 15, narrow, slightly unequal in length. *Female flower* unknown. *Fruit* solitary or in pairs, axillary, pedicelled, rufous-puberulous, ovate, 3 to 4 in. long and about 2 in. in diam.; pedicel very stout, ·5 to ·6 in. long; pericarp thick, fleshy; arillus narrowly laciniate from nearly the base, its segments much conduplicate at the apex of the cylindric-elliptic vertically grooved seed; *seed* 2 in. long and 1 in. in diam., striate. *Hook. fil. Fl. Br. Ind.* v. 104.

South Travancore: in moist forests at the base of the hills. *Colonel R. H. Beddome.*

This species much resembles *M. laurifolia*, Hook. fil. & Thoms., in many respects. But it has larger leaves, densely stellate-tomentose beneath; when young its fruit is larger and more oblong, and its staminal column has a shorter and sericeous stalk. It has, up to the present time, been seen alive by no botanist except Colonel R. H. Beddome, who describes it as one of the finest trees in Southern India, having magnificently butressed stems with many ærial roots. Colonel Beddome has found it only in South Travancore, where it is most abundant at Mimootee, near Colatoorpalay.

Plate 119. Myristica magnifica, *Bedd.* 1, Leaf-twig; 2, branch with part of leaf and clusters of male flowers; 3, fruit opened to show seed with its arillus; 4, arillus; 5, seed—*of natural size;* 6, male perianth with bracteole; 7, section of male flower; 8, andrœcium —*enlarged* (Nos. 3 & 8 are copied from Colonel Beddome's *Fl. Sylv.* 268).

10. Myristica cinnamonea, *n. sp. King.* A tree 60 to 80 feet high; young branches thin, rather dark, sparingly rufous-puberulous at first, finally glabrous. *Leaves* thinly coriaceous, oblong-lanceolate, tapering about equally to either end; upper surface shining, pale brownish-green when dry; lower uniformly covered with a close layer of cinnamoneous, minute, stellate, adpressed hairs; main nerves 14 to 20 pairs, faint on both surfaces, sub-ascending; the midrib stout; length 4·5 to 7·5 in., breadth 1·5 to 2·25 in.; petiole ·5 to ·75 in., scurfy-pubescent. *Male flowers* ·25 in. long, in umbellate 8- to 14-flowered axillary cymes about as long as the petioles; pedicels ·15 to ·2 in. long; bracteole ovate-acute, rufous-tomentose, obliquely embracing one side of the base of the flower. *Perianth* elongate-ovoid, tubular, minutely scurfy-tomentose outside, glabrous within, the teeth rather deep, sub-acute; *andrœcium* cylindric, nearly as long as the perianth, slightly apiculate; anthers about 10, linear, sinuate; stalk nearly as long as the column, scurfy rufous-tomentose. *Female flower* unknown. *Fruit* ellipsoid, tapering slightly to the base, the apex sub-obtuse, 3 to 3·5 in. long and 1·65 in. in diam., slightly ridged along one side, minutely rufous-tomentose; pericarp ·35 to ·5 in. thick, fleshy; peduncle stout, ·25 to 5 in. long; arillus extending to the apex of the seed, thin, deeply laciniate at the sides; *seed* cylindric-ellipsoid, 2 in. long, the testa shining and thin.

Perak: at elevations under 150 feet; common. *King's Collector, Wray.*

The leaves of this species greatly resemble those of *M. iners*, Bl.; but the fruit of this is larger and less pointed: moreover, it is rufous-tomentose, while the fruit of *M. iners* is pale yellowish-green and almost glabrous.

Plate 116. Myristica cinnamonea, *King*. 1, Branch with male flowers; 2, ripe fruit; 3, the same in section; 4, arillus and seed; 5, seed without arillus—*all of natural size;* 6, male flower—*dissected;* 7, androecium—*enlarged.*

11. Myristica crassa, *n. sp. King*. A tree 40 to 60 feet high; young branches rather stout, very dark-coloured, glabrous. *Leaves* coriaceous, oblong, elliptic-oblong or oblanceolate-oblong, sub-acute, the base cuneate; both surfaces glabrous, the lower pale, sub-glaucous; main nerves, 15 to 22 pairs, slightly prominent, spreading; length 7 to 12 in., breadth 2·5 to 4 in.; petiole 1 to 1·25 in., stout. *Male flowers* in many-flowered, sessile umbels from short, woody, axillary peduncles; pedicels ·35 in. long, tomentose like the flowers; bracteole orbicular-ovate, rugose, closely embracing half the flower on one side. *Perianth* minutely rusty-tomentose, ovoid when young, urceolate and slightly constricted below the middle when adult, the apex pointed, 3-cleft to about a third of its length, the teeth ovate-acute; *androecium* narrowly ovoid, apiculate; anthers 14 to 18, linear, closely attached to the column; stalk of column often nearly as long as itself, lepidote. *Female flowers* unknown. *Fruit* solitary or in clusters of 2 or 3, pedunculate, ovoid-globose, slightly pointed, the base rounded or sub-truncate, minutely rufous-puberulous, 1·5 to 3 in. long and half as much in diameter; pericarp thick, succulent; arillus fleshy, laciniate, yellow, extending to the apex of the ovoid seed.

Perak: at low elevations; *King's Collector;* Waterfall Hill, *Wray* No. 646; common. Malacca; *Cantley.*

The fruit is eaten by the Chinese settlers. I have named this from the great thickness and soft texture of the pericarp. The arillus and seed possess considerable fragrance.

Plate 117. Myristica crassa, *King*. 1, Branch with male flowers; 2, mature fruit; 3, section of fruit showing arillus and seed—*of natural size;* 4, male flower; 5, androecium—*enlarged.*

12. Myristica Lowiana, *n. sp. King*. A tree 60 to 80 feet high; glabrous, except the inflorescence and fruit; young branches rather stout, rough, dark-coloured. *Leaves* coriaceous, oblong to elliptic-oblong, sometimes slightly obovate; apex acute, the base cuneate or sub-cuneate, often slightly unequal; upper surface shining, the lower dull, sub-glaucous; nerves 16 to 20 pairs, prominent on both surfaces (impressed on the upper), evanescent towards the margin; length 6 to 10 in, breadth 1·75 to 3 in.; petiole ·75 to 1 in., stout. *Male flowers* in dense, many-flowered glomeruli, shorter than the petioles, from small solitary tubercles in the axils of leaves or of fallen leaves; pedicels ·15 to ·3 in.; bracteole large, ovate or obovate-rotund, embracing more than half the perianth on one side, rusty-pubescent outside, glabrous inside. *Perianth* ·1 in. long, ovoid, fleshy, cut about a third of its length into 3 blunt, broadly triangular teeth, pubescent outside, glabrous and striate inside; *androecium* ellipsoid; stalk stout, much shorter than column, ovoid, puberulous; anthers about 10 to 14, narrowly ovate. *Female flowers* unknown. *Fruit* ovoid, pointed at each end, 2·5 to 3 in.

long and 1·35 to 1·5 in. in diam., covered with rufous, woolly tomentum, rugulose underneath the tomentum, the ridges protruding and glabrous; arillus thin, extending to the apex of the seed, its sides cut into wide areolæ; *seed* ellipsoid, blunt at both ends, about 2 in. long.

Perak: *Scortechini* No. 1551; *King's Collector* Nos. 5537, 7258.

Named in honour of Sir Hugh Low, K.C.M.G., late British Resident at Perak, to whose ever-ready help Malayan Botanists were, for forty years, much beholden.

Plate 120. Myristica Lowiana, *King*. 1, Branch with male flowers; 2, ripe fruit—*of small size;* 3, seed with arillus; 4, the same with arillus removed; 5, male flower—*of natural size;* 6, male flower; 7, androecium and bracteole—*enlarged*.

13. Myristica Maingayi, *Hook. fil. Fl. Br. Ind.* v. 104. A tall tree; young branches rather stout, at first rusty-tomentose, afterwards glabrous, with thin, usually dark bark, often ridged. *Leaves* glabrous, coriaceous, linear-oblong, acute or sub-acuminate; upper surface shining, lower dull, rather darker than the upper; nerves 16 to 18 pairs, slightly prominent beneath, impressed above, evanescent towards the margin; length 5·5 to 8 in., breadth 1·25 to 1·75 in.; petiole ·8 to ·9 in. *Male flowers* rusty-tomentose, ·25 in. long; in drooping, solitary, axillary, 10- to 16-flowered, shortly 2- to 3-branched, umbellate cymes; pedicels ·15 in. long; bracteole half-orbicular, embracing the lower half of the flower on one side. *Perianth* ovate, rusty-tomentose outside, granular within; teeth ovate, acute; *androecium* fusiform, shortly apiculate; anthers 7 or 8, linear; stalk of column very short, rufous-villous. *Female flower* unknown. *Fruit* oblong, 3 to 3·5 in. long and 1·5 in. in diam., blunt, glabrous; peduncle ·75 to 1·25 in. long, stout, woody; pericarp thick, fleshy. Arillus fleshy, reaching to the apex of the seed, deeply fimbriate in its upper half. *Seed* ellipsoid, smooth, 2 in. long.

Malacca: *Maingay* No. 1289 (*Kew Dist.*) Perak; *Scortechini*. Penang; *Curtis* No. 2455.

Plate 114. Myristica Maingayi, *Hook. fil.* 1, Branch with male flowers; 2, ripe fruit; 3, section of ripe fruit; 4, arillus and seed; 5, lateral view of seed—*of natural size;* 6, male flower; 7, male flower laid open; 8, androecium—*enlarged*.

14. Myristica Andamanica, *Hook. fil. Fl. Br. Ind.* v. 103. A glabrous tree, 25 to 40 feet high; young branches slender, smooth. *Leaves* membranous at first, coriaceous when old, ovate-elliptic or elliptic-oblong, or sometimes obovate-oblong, apex acute, base rounded or cuneate; upper surface shining, pale green when dry; lower dull, pale but not glaucous, the midrib strong; lateral nerves 12 to 15 pairs, spreading, rather straight, thin in young leaves, but stout in old ones; length 9 to 14 in., breadth 4 to 6 in.; petiole 1 to 1·25 in., stout. *Male cymes* supra-axillary, on short woody peduncles, 8- to 12-flowered; buds sub-globose, ·15 in. in diam.; pedicels about ·2 in. long; the bracteole large, sub-orbicular, puberulous outside, embracing the lower half of the flower on one side; *perianth* globular, with short triangular acute teeth, puberulous outside, glabrous within; *androecium* short, thick; anthers about 15, linear, extending almost to apex of the column, but not to its base. *Female flowers* unknown. *Fruit* broadly ovoid, 2 to 2·5 in. long, glabrous; pericarp thickly coriaceous, sub-succulent; arillus enveloping the whole of the seed but much laciniate at the sides; *seed* irregularly grooved, shining, ovoid or ovoid-cylindric. M. elliptica, *Kurz Fl. B. Burm.* ii. 282 (*not of Wall.*)

Andaman Islands: at Mount Harriet, elevation 1,200 feet; *Kurz, King's Collector.*

PLATE 115. Myristica Andamanica, *Hook. fil.* 1, Branch with male flowers; 2 & 3, ripe fruit; 4, section of ripe fruit; 5, seeds covered by arillus—*of natural size;* 7, male flower and androœcium—*enlarged.*

15. MYRISTICA ELLIPTICA, *Wall. Cat.* 6798*A*. A tree 60 to 80 feet high; young branches rather slender, pale, at first rusty-puberulous, afterwards glabrous like all the other parts. *Leaves* thickly coriaceous, pale when dry, elliptic, oblong-elliptic to linear-oblong, shortly and rather bluntly acuminate, acute or sub-acute; the base cuneate, slightly unequal; upper surface shining, the lower dull, pale, glaucous; nerves 8 to 12 pairs, slender, sub-ascending, midrib stout; length 5 to 8 in., breadth 1·75 to 3 in.; petiole ·5 to ·75 in. *Male flowers* in shortly pedunculate, slightly supra-axillary umbels rather longer than the petioles; pedicels ·1 to ·2 in.; bracteole sub-orbicular. *Perianth* ·35 in. long, elongate and narrowly tubular, sub-urceolate, divided for $\frac{1}{3}$ to $\frac{1}{2}$ its length into 3 narrowly ovate-acute teeth, with many black glandular dots on both surfaces; puberulous or glabrous outside, glabrous within. *Androœcium* cylindric, nearly as long as the tube; the stalk short and as thick as the column; anthers about 10, linear. *Female flowers* umbellate like the males; *perianth* distinctly urceolate; the lobes ovate, blunt; *ovary* sessile, adpressed-pubescent, elongate-ovoid, tapering above into the oblique lateral stigma; style 0. *Fruit* oblong, ridged along the suture, slightly gibbous, 2·5 to 3 in. long, glabrous; pedicel proper ·25 in. long, stout; pericarp rather thick, succulent; arillus enveloping the whole of the cylindric tapering seed but much laciniate at the sides, rather succulent, red. *Hook. fil. & Thoms. Fl. Ind.* 162; *Hook. fil. Fl. Br. Ind.* v. 102; *A. DC. in Prod.* xiv. 1, 190; *Miq. Fl. Ind. Bat.* i. *pt.* 2, 58. M. calocarpa, *Miq. Fl. Ind. Bat.* i. *pt.* 2, 71; *Suppl.* 383; *Ann. Mus. Lugd. Bat.* ii. 48. M. sycocarpa, *Miq. Fl. Ind. Bat.* i. *pt.* 2, 68; *Ann. Mus. Lugd. Bat.* ii. 48.

Miquel's type specimens of *M. calocarpa* from Sumatra and Borneo agree with this perfectly, and he himself reduced *M. sycocarpa* here (*Ann. Mus. Lugd. Bat.* ii. 48). This comes very near M. succedanea, *Reinw.* (*Rumphia* i. 186; *Miq. Fl. Ind. Bat.* i. *pt.* 2, 56; & *Ann. Mus. Lugd. Bat.* ii. 56), which has, however, rufous-tomentose fruit.

Penang and Singapore, *Wallich, Ridley.* Malacca, *Maingay* (*Kew Distrib.* 1296). Perak, *King's Collector, Wray, Scortechini.*

PLATE 113. Myristica elliptica, *Wall.* 1, Branch with male flowers; 2, ripe fruit—*of natural size;* 3, male flower and androœcium; 4, female—*enlarged.*

16. MYRISTICA SUAVIS, *n. sp. King.* A tree; all parts glabrous, except the minutely pubescent leaf-buds and flowers; young branches rather stout, cinerous, striate, the tips dark-coloured and smooth. *Leaves* coriaceous, elliptic-lanceolate, acute at either end, the base slightly unequal-sided; upper surface glabrous, dull, the lower paler; main nerves, 20 to 25 pairs, rather straight, spreading, their apices evanescent, impressed on the upper, but bold and prominent on the lower surface; length 6 to 9 in., breadth 2 to 2·25 in.; petiole 1 in., stout, channelled in front. *Male flowers* 2 to 4, on short woody racemes from the axils of the leaves, or close together on the branches below the leaves; pedicels about ·1 in. long; bracteole broad, half-orbicular, embracing the base of the flower on one side. *Perianth* narrowly campanulate, cut half-way down into 3

triangular, acute, recurved teeth, scurfy-tomentose outside, glabrous inside; *androecium* shortly stalked, cylindric, not apiculate; anthers about 6, linear, connate. *Female flower* like the male, but with longer, stouter pedicels and shorter teeth; *ovary* narrowly ovoid, minutely tomentose; stigma sessile, divided by a central groove into two oblong lobes; arillus of young seed extending to its apex, deeply and narrowly laciniate. *Fruit* unknown.

Selandor: Singapore Botanic Garden Collectors.

I have seen only a single specimen of this, kindly lent to me by Mr. H. M. Ridley, F.L.S., Director of the Botanic Garden, Singapore. It is very distinct from any other species of this section by its campanulate male flowers, which are borne on short, wart-like racemes. The female flowers on the solitary specimen which I have seen have 4 rudimentary anthers, as shown in figure 6 of the accompanying plate. The young fruit is very fragrant, having a powerful odour of pimento and nutmeg combined.

Plate 121. Myristica suavis, *King*. 1 & 2, branches with male flowers; 3, branch with recently fertilised ovaries—*of natural size*; 4, male flower with its bracteole; 5, androecium; 6, ovary and stigma with rudimentary stamens; 7, recently fertilised ovary; 8, arillus from recently fertilised ovule—*enlarged*.

Sub-sect. Horsfieldia. *Male flowers* minute, in many-flowered glomeruli, mixed with sub-persistent bracteoles on large, open, branching panicles. *Androecium* and *fruit* as in *Eumyristica*.

17. Myristica Horsfieldii, *Blume Bijdr.* 577 & *Rumphia* i. 192, *t.* 63 (*not of Wall.*) A tree 40 or 50 feet high; young branches rather slender; at first densely and minutely tawny-tomentose, ultimately glabrous, shining, dark-coloured. *Leaves* very coriaceous, elliptic-oblong or oblong, acute; the edges when dry slightly recurved, the base rounded or sub-emarginate; upper surface glabrous, shining; lower at first rusty-tomentose, finally glabrous and pale; main nerves 16 to 24 pairs, prominent beneath, spreading and interarching submarginally; length 7 to 10 in., breadth 2·5 to 4·5 in.; petiole ·75 to 1 in., stout. *Male panicles* axillary, spreading, 3 to 5 in. long and 3 in. broad, softly rusty-tomentose. *Flowers* numerous, very small, closely packed in small capitules ·25 to ·5 in. in diam., which are distantly scattered upon the stout rufous-tomentose branches and rachis. *Perianth* obovate, ·05 in. in diam., sessile, glabrous; the bracteoles between the flowers sub-persistent, orbicular, woolly outside; *androecium* sessile, clavate, depressed at the top; anthers about 6, linear, confluent. *Female panicles* short, few-flowered; *perianth* as in the male; *ovary* ovoid-globose, rusty-tomentose; stigma sessile. *Fruit* shortly peduncled, sub-globular, obtuse, slightly grooved, glabrous, about 2 in. in diam.; pericarp succulent; arillus pale, fleshy, entire, completely enveloping the smooth ovoid seed. *Hook. fil. & Thoms. Fl. Ind.* 163; *Hook. fil. Fl. Br. Ind.* v. 106; *A. DC. in Prod.* xiv. 1, 200; *Miq. Fl. Ind. Bat.* i. *pt.* 2, *p.* 63 (*excl. syn.* M. ferruginea, *Wall.*, *from all the foregoing*). M. glomerata, *Miq. Pl. Jungh.* i. 171. M. Iryaghedi, *Gærtn. Fruct*, i. 196, *t.* 41, *fig.* 4 (*excl. syn.*) Pyrrhosa Horsfieldii, *Wight Ic.* 1857 (*very bad*). Horsfieldia odorata, *Willd. Sp. Pl.* iv. 872.

Ceylon, common; Singapore and Java (cultivated).

Dr. Trimen informs me that this is a common tree in the low country in Ceylon. It is truly wild there, and he never saw it cultivated. Blume's original spelling was *M. Horsfieldia*, but he afterwards corrected it to *M. Horsfieldii*.

PLATE 122. Myristica Horsfieldii, *Blume*. ♂ 1, Branch with male panicles; 2, vertical section of a glomerulus of male flowers—*of natural size;* 3 & 4, male flowers 3 and 4-cleft; 5, vertical section of flower showing androœcium—*enlarged.*

PLATE 123. Myristica Horsfieldii, *Blume*. ♀ 1, Branch with ripe fruit; 2, vertical section of ripe fruit and seed—*of natural size;* 3, panicle of female flowers; 4, ovary after the fall of the perianth—*enlarged.* (*All copied from a drawing kindly lent to me by Dr. Trimen,* F.R.S., *of the Peradeniya Botanical Garden.*)

Sect. II.—PYRRHOSA (*Pyrrhosa*, Blume). *Male flowers* minute, in many-flowered, branching, often large and spreading, panicles; *perianth* ebracteolate, usually 3-toothed, sometimes 4-toothed; *androecium* short, sub-globular or 3-gonous, rarely cylindric, usually sessile; *anthers* not elongate, completely attached to the column by their backs, the apices sometimes free for a short way. *Fruit* globose or ovoid-globose; the pericarp usually leathery and only slightly succulent.

18. MYRISTICA FULVA, *n. sp. King.* A tree; young branches rather stout, pale brown, slightly rough, scurfy, rufous-puberulous when very young. *Leaves* very coriaceous, elliptic-oblong, slightly obovate, sub-acute, the base cuneate; both surfaces dull, pale brownish (when dry), the lower the paler; main nerves 12 to 14 pairs, stout, rather straight, spreading, the petiole and the midrib on both surfaces scurfy rufous-pubescent, otherwise glabrous; length 5 to 6·5 in., breadth 1·75 to 2·35 in.; petiole ·25 to ·4 in., stout. *Male flowers* from the young branches below the leaves, in crowded, spreading, many-flowered, scurfy, stellate-pubescent, rufous panicles, 2 to 3 in. long. *Flowers* elongate-ovoid or slightly obovoid, ·15 in. long; *perianth* leathery, glabrous on both surfaces, divided for $\frac{1}{3}$ or $\frac{1}{4}$ of its length into 3 broadly triangular teeth. *Androecium* sessile, cylindric, slightly apiculate; anthers about 10, linear-elongate, connate from base to apex. *Female flowers* unknown. *Fruit* from the branches below the leaves, solitary, on woody, warted, often curving peduncles ·5 in. or more long, ovoid, compressed, slightly pointed, glabrous, 1 in. long and ·75 in. in diam.; pericarp thick, sub-succulent, dehiscing into 2 divaricating valves; arillus thin but tough, entire, completely enveloping the broadly ovoid seed; testa shining, thin, the rugulose albumen appearing through it.

Malacca: *Maingay* (*Kew Distrib.*) No. 1304. Perak, *Scortechini* No. 184A.

Maingay's MSS. note on the fruit of his No. 1304 is as follows:—"Fruit sub-globose, $1\frac{1}{4}$ by $\cdot 1\frac{1}{3}$ in., glabrous, pale yellowish; pericarp thick, fleshy, ·2 to ·3 in. thick; aril complete, slightly lobed at the top, clear reddish-orange; testa slightly crustaceous, pale brown."

PLATE 124. Myristica fulva, *King*. 1, Branch with panicles of male flowers (from Scortechini's specimen No. 184A); 2, fruit (from Maingay's No. 1304)—*of natural size;* 3, male flower; 4, androœcium—*enlarged.*

19. MYRISTICA MURTONI, *Hook. fil. Fl. Br. Ind.* v. 105. A tree 70 feet high; young branches stout, rustily-tomentose, as are the young leaves beneath and the panicles. *Leaves* thinly coriaceous, oblong or elliptic-oblong, acute, the base rounded

or cordate, upper surface glabrous, shining; the lower, when adult, glaucous and quite glabrous; main nerves 17 to 30 pairs, spreading, impressed above, prominent beneath; length 10 to 13 in., breadth 3·25 to 5 in. *Male panicles* stout, shortly pedunculate, densely-flowered, 1 to 2 in. long; *perianth* ·2 in. long, ovoid in bud, campanulate when open, deeply divided into 3 ovate, sub-acute teeth, rufous-tomentose both outside and inside; *andrœcium* sessile, cylindric, truncate; anthers about 9, linear, slightly free at their edges, the apices free and apiculate. *Female flower* and *fruit* unknown.

Singapore and Malacca: *J. H. Murton.*

The above description is copied mainly from Sir Joseph Hooker (in *F. B. I.*) The only specimen which I have seen is that from which the drawing was made. It was collected at Malacca. Its single fascicle of male flowers is detached. On the ticket which accompanies it there is written this note:—"A tree 70 feet high, bearing very large fruit, some 3 inches in diameter; leaves only, the tree not having flowered or fruited this year." The leaf part of the specimen resembles *M. bracteata*, A. DC., but the flowers are unlike those of any other that I have seen.

Plate 124 *ter*. Myristica Murtoni, *Hook. fil.* 1, Leaf-twig; 2, fragment of a panicle of male flowers—*of natural size;* 3, male flower; 4, andrœcium—*enlarged.*

20. Myristica ferruginea, *Wall. Cat.* 6803. A tree; young branches stout, densely covered with very short, rufous tomentum, beneath which they are minutely lenticellate and striate; leaf-buds densely rufous-lanose. *Leaves* coriaceous, elliptic-ovate, very shortly and suddenly acuminate, the base broadly rounded and often emarginate; upper surface glabrous, shining; lower covered with loose deciduous rusty tomentum, finally glabrous and sub-glaucous; main nerves 20 to 22 pairs, sub-horizontal, rather prominent beneath, curving upwards and interarching at the much more slender tips; length 9 to 12 in., breadth 4 to 4·5 in., petiole ·6 in. *Male panicles* axillary, with few short, condensed, many-flowered, spreading branches, the branches as well as the flowers densely silky rufous-tomentose, 2 to 2·5 in. long and 1·25 in. broad; buds ovoid, ·15 in. long; the pedicels much shorter; *perianth* leathery, with 2 or sometimes 3 teeth, tomentose outside, glabrescent inside; *andrœcium* sessile, broadly ovoid, its apex obtuse; anthers about 18, narrow, elongate, firmly united to the column and to each other, their apices alone free. *Female flower* and *fruit* unknown.

Singapore: *Wallich, Ridley.*

This species, for many years known only by Wallich's fragmentary flowerless specimens, has been recently collected by Mr. H. M. Ridley, Director of the Botanical Garden, Singapore. Mr. Ridley's, which agree exactly with Wallich's specimens (as far as the latter go), are males; females being still unknown. The *andrœcium* closely approaches that of *Eumyristica*, inasmuch as the anthers are much elongate and connate with each other and with the column. The panicles, however, are quite those of *Pyrrhosa*. This species and *M. fulva* thus form, as regards andrœcium, a connecting link between these two sections.

Plate 125. Myristica ferruginea, *Wall.* 1, Branch with male panicle (the lower surface of the leaf exposed); 2, leaf, upper surface—*of natural size;* 3 & 4, male flowers; 5, perianth segment seen from inside; 6, andrœcium—*enlarged.*

21. Myristica superba, *Hook. fil. & Thoms. Fl. Ind.* 162. A tree 40 to 50 feet high; young branches stout, covered (as are the under surfaces of the leaves and the panicles)

with loose, scurfy, bright, rufous, minute, stellate tomentum; the branches ultimately glabrous, striate, lenticellate, cinereous. *Leaves* large, coriaceous, elliptic to elliptic-lanceolate or oblanceolate, acute or shortly acuminate; the base cuneate, slightly unequal; upper surface, when young, covered with dense, minute, rusty tomentum, which is permanent only along the midrib, the rest of the upper surface ultimately glabrous; main nerves 15 to 30 pairs, impressed on the upper, very prominent (almost winged in old leaves) on the lower surface, (when dry), spreading, sub-ascending, rather straight, but curving and interarching within the edge; length 10 to 25 in., breadth 4 to 8 in., petiole ·5 to 1 in., tomentose. *Male panicles* robust, from the axils of fallen leaves, 4 to 6 in. long; *perianth* ·25 in. long, leathery, ellipsoid or slightly obovoid, obtuse, with 3 or 4 triangular teeth; pedicel about as long or shorter, glabrous; *andræcium* shorter than the perianth, not apiculate, ovoid, obtuse; anthers nearly 20, quite connate to the column and to each other. *Female flowers* on stout woody racemes, 1 in. or more long; the rachis woody, pale, rufous-tomentose; *perianth* coriaceous, glabrous, widely tubular with 2 or 3 acute, shallow teeth; *ovary* ovoid, slightly oblique, glabrous, grooved at one or sometimes on both sides; stigma flat. *Fruit* ovoid-globose, rough, warted, glabrescent, 2·5 to 3 in. long and nearly 2 in. in diam.; peduncle stout, woody, ·5 in. long; pericarp succulent, ·5 to ·75 in. thick. *A. DC. in Prod.* xiv. 1, 194; *Miq. Fl. Ind. Bat.* i. *pt.* 2, 62; *Hook. fil. Fl. Br. Ind.* v. 105.

Penang; *Phillips.* Perak; near Gunong Batu Puteh, at an elevation of from 1,500 to 2,000 feet, *King's Collector* No. 8024, *Scortechini.*

This resembles *M. rubiginosa* and *M. flocculosa* in its leaves, but is at once distinguishable from both by the much larger size of its male flowers and by its ovoid, obtuse androecium.

Plate 125 *bis.* Myristica superba, *Hook. fil. & Thoms.* 1, Leaf; 2, male panicle; 3, ripe fruit; 4, section of ripe fruit showing pericarp and seed—*of natural size;* 5 & 6, male flowers; 7, andrœcium—*enlarged.*

Plate 124 *bis.* Myristica superba, *Hook. fil.* 1, Branch with panicles of male flowers; 2, raceme of female flowers—*of natural size;* 3, perianth of female flower; 4 & 5, ovaries—*slightly enlarged.*

22. Myristica Prainii, *n. sp. King.* A tree 40 to 60 feet high; all parts glabrous except the inflorescence; young branches rather stout, smooth, dark brown. *Leaves* thinly coriaceous, elliptic-oblong to broadly-elliptic, acute (usually rather abruptly so); the base rounded, sub-truncate or emarginate; both surfaces rather dull when dry, the lower paler; main nerves 15 to 18 pairs, thin but prominent, horizontal at the base, spreading towards the apex; length 6 to 10 in., breadth 2·75 to 4·5 in.; petiole ·6 to ·75 in., stout. *Male panicles* from the branches below the young leaves, lax, much branched, wider than long, sub-glabrous below, rusty-pubescent above; 4 to 5 in. long and 5 to 7 in. wide. *Flowers* ·05 in. in diam., in umbellules of about 6, pedicellate; pedicels longer than the perianth; *perianth* ovoid, 2-valved, sometimes 3-toothed; *andræcium* much shorter than the perianth, compressed-globular, minutely apiculate, shortly stalked; anthers 8, short, ovate, extrorse, confluent. *Female flowers* unknown. *Fruit* ovoid, slightly gibbous at the base at one side, 1·5 in. long; peduncle ·5 in., very stout; pericarp rather thick, coriaceous; arillus thin, fleshy, deeply laciniate, extending to the apex of the ellipsoid, shining seed.

Andaman Islands: *Calcutta Bot. Garden Collectors* Nos. 417, 431; *Carter.*

PLATE 126. Myristica Prainii, *King*. 1, Branch with male panicles; 2, ripe fruit 3, section of ripe fruit; 4, arillus covering seed—*of natural size;* 5, male flower; 6, androœcium—*enlarged.*

23. MYRISTICA KINGII, *Hook. fil. Fl. Br. Ind.* v. 106. A tree 30 feet high; young branches very stout, rough, scurfy-puberulous at the very tips. *Leaves* thinly coriaceous, obovate or oblanceolate, slightly oblique, shortly and sometimes bluntly acuminate, much narrowed to base; upper surface dull, dark brown when dry, the lower pale brown both glabrous, except the scurfy-pubescent midrib when young; nerves 14 to 18 pairs, slender, spreading; length 6 to 10 in., breadth 2·5 to 4·5 in.; petiole ·75 to 1·25 in. *Male panicles* from the axils of fallen leaves, about 3 in. long, their branches short, spreading, scurfy-tomentose. *Flowers* on very short pedicels, not crowded, ·13 in. in diam., globose, scurfy-tomentose; *perianth* thick, the teeth triangular, acute, glabrous inside; *andrœcium* sessile, depressed-globose, the apex concave, obscurely 3-cleft; anthers about 30, completely united, convex. *Female panicles* only 1 to 1·35 in. long, stout, rigid, the flowers obovoid, ·15 to ·2 in. long; *perianth* very thick, often only bifid, not 3-toothed; *ovary* sessile, obovate; the stigma small. *Fruit* ovoid, tapering to each end, 1·5 to 1·75 in. long and 1 in. in diam.; pericarp thin, leathery, minutely rugose, glabrous; peduncle stout, ·35 in. long; arillus thin, fleshy, entire, completely enveloping the narrowly ovoid, pointed, smooth seed.

Sikkim Himalaya: alt. 1,000 to 2,000 feet, *King, Gammie.* Assam; Mikir Hills, *Simons;* Sibsagar, *Jenkins;* Satsua, *Masters;* Cachar, *G. Mann.*

PLATE 127. Myristica Kingii, *Hook. fil.* 1, Branch with male panicles; 2, female panicle; 3, ripe fruit; 4, vertical section of same through the albumen; 5, arillus enveloping seed—*of natural size;* 6, male flower; 7, the same seen from above; 8, androœcium; 9, female flower; 10, ovary—*enlarged.*

24. MYRISTICA AMYGDALINA, *Wall. Pl. As. Rar.* i. 79, *t.* 90. A tall glabrous tree; young branches rather stout, the bark cinereous, rough; the tips dark, smooth. *Leaves* membranous, oblanceolate to elliptic-oblanceolate, acute, the base much narrowed; when dry both surfaces rather dull, the lower pale brown; nerves 8 to 10 pairs, faint, spreading; length 4 to 7 in., breadth 1·25 to 2 in., petiole ·4 to ·75 in. *Male panicles* 3 to 4 in. long and 2 to 3 in. broad, spreading, many-flowered, axillary, puberulous or glabrous. *Flowers* under ·1 in. in diam., globular, glabrous; *perianth* thin, usually with 3 broadly triangular teeth, but sometimes only bifid; pedicels as long as the perianth. *Andrœcium* sessile, depressed-globose; anthers about 15, linear, convex, confluent. *Female flowers* in short, few-flowered racemes on the older branches, globular, glabrous, ·15 in. in diam. bifid or trifid, the pedicel about as long as the perianth; *ovary* sessile, broadly ovoid, apiculate, hooked, glabrous. *Fruit* 1·5 in. long, narrowly ovoid, pointed, glabrous, grooved on one side, the pericarp fleshy; arillus thin, fleshy, laciniate from the apex, the lobes narrow, often imbricate. *Seed* oblong-cylindric, ·8 in. long; reticulate, smooth. *Wall. Cat.* 6797; *Hook. fil. & Thoms. Fl. Ind.* 160 (*excl. syn.* M. exaltata, *Wall.*) *A. DC. in Prod.* xiv. 1, 203 (*excl. var. Hookeri*); *Miq. Fl. Ind. Bat.* i. *pt.* 2, *p.* 67. M. floribunda, *Wall. Cat.* 6805.

Silhet, *Wallich.* Cachar, *G. Mann.* Assam, *Masters.* Khasia, *Hooker.* Burmah, *Wallich, Helfer,* No. 4358, *Brandis, Falconer.*

This species cannot be very much different from *M. glabra,* Bl.

Plate 128. Myristica amygdalina, *Wall.* 1, Branch with ripe fruit (copied from Wallich *Pl. As. Rar. t.* 90); 2, male panicle (from a specimen collected in Assam by Masters); 3, ripe fruit; 4 & 5, sections of ripe fruit; 6 to 9, seeds and arillus—*of natural size;* 10, male flower; 11, the same seen from above; 12, androecium; 13, female flower; 14, ovary—*enlarged.*

25. Myristica sucosa, *n. sp. King.* A tree 60 to 100 feet high; young branches rather stout with rather rough bark, the tips of which, as well as the leaf-buds and surfaces of the youngest leaves, are covered with deciduous, scurfy, minute tomentum. *Leaves* coriaceous, oblanceolate or obovate-lanceolate, acute or acuminate, much narrowed from the middle or above it to the petiole; both surfaces glabrous, the lower paler; main nerves 9 to 14 pairs, prominent and minutely winged on the lower surface, inconspicuous on the upper; length 5 to 10 in., breadth 2 to 3 in.; petiole ·5 to ·75 in. *Male panicles* from the branches below the leaves, 3 to 4·5 in. long including the peduncle, from 2 to 3 in. wide, branching above, their branchlets scurfy; pedicels slender, ·15 to ·2 in. long. *Flowers* numerous, sub-globular, ·1 in. in diam.; *perianth* puberulous externally, glabrous within, with several bold vertical lines, inflated, bivalved or with 3 triangular teeth; *andrœcium* sessile, sub-globular, truncate; stamens 10, sub-equal, sub-erect, connate by their sides, the apices free. *Female panicles* axillary, stout, rigid, spreading, rusty-puberulous, 1·5 in. long and about 1·25 in. broad. *Flowers* ovoid-globose, glabrous; *perianth* fleshy, with 3 short triangular teeth; *ovary* sessile, ovoid-globose, glabrous; stigma sessile, grooved, prolonged on one side. *Fruit* solitary or 2 or 3 in a raceme; when ripe ovoid or pyriform, very succulent, glabrous, 2·5 to 3 in. long and 1·75 to 2 in. in diam.; peduncle woody, 1·75 in. long; pericarp ·5 in. thick. *Seed* ovoid, about 1·25 in. long; arillus fleshy, yellow, enveloping the whole of the seed, slightly laciniate and conduplicate at the apex, otherwise entire.

Perak: *King's Collector* Nos. 4078, 4647 & 10475; *Wray* No. 467. Malacca, *Maingay* (*Kew Distrib.* No. 1300).

By the kindness of Sir Joseph Hooker (who was so good as to copy it for me), I am able here to quote Maingay's MSS. note made on his specimen No. 1300 (Kew Distrib.) while it was fresh. It is as follows:—"Fruit ovoid, very succulent, broad and obtuse at the base, fleshy, $2\frac{3}{4} \times 2\frac{1}{2}$ in., pale yellowish-buff or pinkish above, perfectly shining and glabrous. Epicarp distinct. Arillus rather fleshy, $\frac{3}{20}$ of an inch thick, pale yellow, slightly lobed at the apex. Putamen dark brown, crustaceous, covered by a thin pale green membranous investment which, for want of a better name, I call endocarp. A small tree which, when in full bearing, presents a very elegant appearance from the abundance of pomiform, shining, buff or yellow, large fruit."—Malacca, 28th May 1867.

Plate 172. Myristica sucosa, *King.* 1, Branch with young fruit; 2, male panicle; 3, female panicle; 4, section of ripe fruit—*of natural size;* 5 & 6, male flowers; 7, andrœcium; 8, female flower; 9, ovary—*enlarged.*

26. Myristica tomentosa, *Hook. fil. & Thoms. Fl. Ind.* 161 (*not of Blume's Bijdr.* 577, *nor of Thunb.*) A tree 15 to 60 feet high; young branches slender, rusty stellate-tomentose, as are the lower surfaces of the younger leaves and the branches of the inflorescence. *Leaves* sub-coriaceous, elliptic, elliptic-oblong, sometimes oblanceolate or lanceolate; apex suddenly acute or sub-acute, base cuneate; upper surface glabrous, dull brown when dry;

lower reddish-brown, sub-glabrescent when old, stellate rusty-tomentose when young; nerves 12 to 15 pairs, sub-erect, rather straight, slightly prominent on both surfaces; length 6 to 10 in., breadth 2·5 to 3·25 in.; petiole about ·6 in., slender. *Male panicles* 2·5 to 4 in. long, many-branched and many-flowered, the branches spreading, laxly rufous-tomentose; buds globose, on pedicels ·05 in. long, ebracteolate; *perianth* glabrous, thin, divided half-way into 3 or 4 broad triangular acute teeth. *Andrœcium* sessile, depressed-globose, obtusely 3 or 4-angled; anthers 12 to 15, narrowly ovoid, much incurved at either end, confluent. *Female flowers* unknown; the young fruits in short, solitary, 8 to 10-flowered racemes. *Ripe fruit* in lax racemes of 3 to 5, ·75 to 1 in. long, ovoid, slightly flattened, ridged along the suture, sub-glabrous; pericarp fleshy; pedicel about ·25 in. long; arillus fleshy, entire, not laciniate or areolate, enveloping the whole of the shining seed. *Hook. fil. Fl. Br. Ind.* v. 105; *A. DC. in Prod.* xiv. 1, 204; *Miq. Fl. Ind. Bat.* i. *pt.* 2, *p.* 68. Myristicacea, *Wall. Cat.* 9025.

Penang, *Curtis* No. 1748; Malacca, *Maingay* (*Kew Distrib.*) No. 1284, *Cantley;* Perak, *King's Collector;* common.

Plate 129. Myristica tomentosa, *Hook. fil. & Thoms.* 1, Branch with male flowers; 2, twig with young fruit; 3 & 4, ripe fruit; 5 & 6, arillus and seed—*of natural size;* 7, male flower; 8, andrœcium; 9, andrœcium from above—*enlarged.*

27. Myristica rubiginosa, *n. sp. King.* A tree 20 to 30 feet high; young branches stout, at first densely rufous-tomentose, ultimately deeply striate, tomentose on the ridges and glaucous in the furrows. *Leaves* large, thinly coriaceous, elliptic-oblong, very shortly and suddenly acuminate, or blunt, the edges slightly recurved when dry, base rounded or very slightly cuneate; upper surface deeply reticulate, rugulose, scabrid from numerous short, stiff, branching, rusty hairs; the midrib and nerves rusty-tomentose; glabrescent when old; lower surface densely and uniformly covered with bright, reddish-brown, stellate tomentum, the reticulations prominent; main nerves 16 to 19 pairs, spreading and arching within the margin, prominent on the lower, depressed on the upper surface; length 10 to 12 in., breadth 4 to 5·5 in.; petiole ·1 to ·25 in., tomentose. *Male panicles* from the axils of leaves or of fallen leaves, 7 to 9 in. long and 2·5 to 3 in. broad, branching from the base, many-flowered, the rachis and branches rufous-lanate. *Flowers* glabrous, globular, ·05 in. in diam., in small crowded racemes at the apices of the branchlets; pedicels as long as the flowers, glabrous. *Perianth* thin, with black dots, the teeth 3 or 4, triangular; *andrœcium* sessile, turbinate; anthers about 15, confluent, convex. *Female flowers* and *fruit* unknown.

Singapore; *King's Collector* No. 1233.

Plate 130. Myristica rubiginosa, *King.* 1, Branch with male panicles—*of natural size;* 2, male flower; 3, male flower dissected; 4, andrœcium—*enlarged.*

28. Myristica flocculosa, *n. sp. King.* A tree 40 to 60 feet high; branchlets stout; when young densely clothed with thick, felted, bright rufous tomentum; when old sub-glabrous, striate, rough and cinereous. *Leaves* large, coriaceous, oblong-lanceolate or oblanceolate, sub-acute or acute, the edges revolute when dry; the base rounded or slightly cuneate; upper surface hispid-puberulous; the midrib and nerves flocculent-tomentose when young, but ultimately glabrous; lower densely covered with pale rufous, stellate, flocculent tomentum, the edges recurved when dry; main nerves 15 to 20 pairs,

impressed on the upper, boldly prominent on the under surface, rather straight, but interarching close to the margin; length 12 to 18 in., breadth 4 to 7 in.; petiole ·5 to 1 in., very stout, tomentose. *Male panicles* robust, spreading, many-flowered, from the axils of fallen leaves, 6 to 8 in. long and 3 to 4 in. broad; rachises and peduncles flocculent rufous-tomentose. *Flowers* ·1 in. long, ovoid-globose, slightly obovoid, inflated, pedicelled, ebracteolate, glabrescent; the *perianth* thin, its teeth 3 or 4, rather shallow, acute; pedicels ·2 to ·25 in. long, slender, glabrous. *Andræcium* sub-sessile, obovate, its apex truncate, non-apiculate; anthers about 10, elongate, confluent. *Female flowers* unknown.

Perak: alt. about 600 feet. *King's Collector* No. 8618.

PLATE 131. Myristica flocculosa, *King*. 1, Branch with panicle of male flowers—*of natural size;* 2, male flower; 3, andrœcium—*enlarged*.

29. MYRISTICA WALLICHII, *Hook. fil. & Thoms. Fl. Ind.* 161. A tree 100 feet or more in height; young branches stout, rather rough, of a dark-grey colour, the youngest minutely rusty-tomentose. *Leaves* coriaceous, oblong and acute, or rarely elliptic and blunt, the base sub-truncate, emarginate, or sub-cuneate; upper surface shining, greenish-brown, glabrous; lower surface rufous-brown, loosely and deciduously stellate-tomentose; main nerves 16 to 22 pairs in the oblong, but only 10 to 12 in the elliptic forms, stout, rather straight, sub-ascending, forming bold sub-marginal areolæ; length of the elliptic forms 6 to 8 in., breadth about 4 in.; length of the oblong forms 10 to 14 in., breadth 3 to 4·25 in.; petiole ·5 to ·75 in., stout, channelled. *Male panicles* 4 to 12 in. long, stout, spreading, rufous-tomentose, axillary or from the axils of fallen leaves, many-flowered; *flowers* glabrous, globose, ·1 in. long, ebracteolate, on very short tomentose pedicels, in compact globose clusters of 8 to 10; *perianth* fleshy, glabrous, sometimes granular, teeth 3 or 4, triangular, acute; *andræcium* sessile, obovate-globose, the apex depressed, deeply 3-cleft; anthers about 15, incurved, confluent. *Female panicles* stouter and much shorter than the male and fewer-flowered, the flowers larger; *perianth* coriaceous, tomentose externally at the base, otherwise glabrescent, teeth 3, spreading; *ovary* globose, sessile, glabrous; stigma sessile, small, linear. *Fruit* (quite young) ovoid, smooth, on a short stout pedicel, the slightly enlarged perianth persistent at its base. *Hook. fil. Fl. Br. Ind.* v. 105; *A. DC. Prod.* xiv. 1, 203; *Miq. Fl. Ind. Bat.* i. *pt.* 2, *p.* 67. M. crassifolia, *Hook. fil. & Thoms. Fl. Ind.* 160; *Miquel l. c.* 68. M. Horsfieldia, *Wall.* (*not of Blume*) *Cat.* No. 6806.

Singapore; *Wallich, Lobb, Maingay* No. 1283 (*Kew Dist.*), *Ridley*. Malacca, *Maingay* No. 1284 (*Kew Dist.*) Perak; *Scortechini* No. 246, *King's Collector* No 4827.

A species very imperfectly represented in collections. It was first issued by Wallich as No. 6806 of his catalogue, doubtfully under the name of *M. Horsfieldia*, Blume (which it is not), and with the remark "*forsan duæ species mixtæ*." There were really three species under his No. 6806; this being one, and the others, according to Sir Joseph Hooker, being *M. crassifolia*, H. f. & Th., and *M. polyspherula*, H. f.

PLATE 132. Myristica Wallichii, *Hook. fil. & Thoms.* 1, Branch with male flowers—*of natural size;* 2, male flower; 3, male flower dissected; 4, andrœcium—*enlarged*.

PLATE 133. Myristica Wallichii, *Hook. fil. & Thoms.* 1, Branch with female flowers; 2, panicle of young fruit; 3 & 4, young fruit—*of natural size;* 5, female flower; 6, female flower seen from above; 7, ovary—*enlarged*.

30. Myristica canarioides, *n. sp. King.* A tree 30 to 50 feet high; all parts quite glabrous, except the panicles; youngest branches dark-coloured, slender; the older cinereous, striate. *Leaves* coriaceous, elliptic-oblong to elliptic, sub-acute, the edge slightly revolute, the base rounded, slightly oblique; both surfaces brown when dry, the lower slightly paler than the upper; nerves 12 to 15 pairs, sub-obsolete above, slightly prominent beneath, sub-horizontal; length 5 to 8 in., breadth 2 to 3 in.; petiole ·3 to ·5 in., stout. *Male panicles* axillary and from the axils of fallen leaves, slender, much-branched, many-flowered, spreading, 2 to 3 in. long by nearly as much wide, the rachises puberulous. *Flowers* globular, ·05 in. in diam.; pedicels as long as the flower, both glabrous; *perianth* 2 to 3-toothed, glabrous; *andrœcium* sessile, turbinate, almost annular; *anthers* about 10, ovate, convex, conjoined from base to apex. *Female panicles* spreading, lax, slender, 6 to 9 in. long. *Flowers* unknown. *Fruit* oblong-ovoid, blunt at the apex, slightly narrowed at the base, 2·5 to 3 in. long, 1·25 in. in diam., glabrous; the pericarp leathery, ·25 in. thick; arillus thin, fleshy, extending to the apex of the seed, slightly laciniate, occasionally with wide areolæ at the sides; *seeds* 2 in. long, cylindric-elliptic, the apex sub-apiculate, the base rounded, smooth, with bold longitudinal coloured markings.

Malacca; *Maingay* No. 1298 (*Kew Distrib.*) Perak, in Ulu Bubong, at elevations of 400 to 600 feet—*King's* Collector Nos. 10064, 10194, 10816 & 10845.

This is the plant alluded to by Sir J. D. Hooker in *Fl. Br. Ind.* v. 113, as probably a new species; but which he was unable to describe owing to the incompleteness of the only specimens before him (*Maingay's* No. 1298). The much fuller material lately sent from Perak by the Calcutta garden collector removes now all doubt as to the novelty of the species. This plant has the double peculiarity of being monœcious and of having its male panicles much smaller than the female. It is true that Blume figures his species *M. javanica* (*Rumphia* i. *t.* 62) as monœcious; but in his text (p. 191) he describes it as diœcious; while in the explanation of his figure he makes no mention of the fact that his artist has shown both kinds of panicles on the same branch. It is probable therefore that *M. javanica*, Bl., is not monœcious. I have named this *M. canarioides* from the likeness of the long racemes of fruit to those of a *Canarium*. The leaves are also not unlike the leaflets of a species of that genus. Closely resembling this in the extraordinary length of the racemes of fruit are two species—one from Tavoy, *Wall. Cat.* No. 6804A, and the other collected in Penang by Mr. Curtis (*Herb. Curt.* No. 934).

Plate 134. Myristica canarioides, *King.* 1, Branch with male panicles; 2, panicles of young fruit (from another tree); 3, ripe fruit; 4, the same cut open to show seed; 5, arillus covering seed; 6, seed—*of natural size;* 7, male flower; 8, andrœcium—*enlarged.*

Sect. III.—Gymnacranthera (*A. DC.*) *Panicles* as in *Pyrrhosa*, but short; *perianth* ebracteolate, 3-toothed; *andrœcium* shortly cylindric or sub-quadrangular and truncate; *staminal column* sessile, short; the *anthers* connate to the column by their connectives only, their margins and apices quite free; stigma sessile, 2-lobed; *fruit* and leaves small.

31. Myristica Griffithii, *Hook. fil. Fl. Br. Ind.* v. 109. A tree 25 to 30 feet high; all parts glabrous except the minutely pubescent panicles and flowers; young branches slender, brown, the tips dark-coloured. *Leaves* coriaceous, oblong lanceolate, acute or

shortly acuminate; the edges slightly recurved when dry, the base cuneate; upper surface glabrous and shining, the nerves indistinct; lower of a pale purplish-brown, when dry glaucous, the nerves thin but distinct; main nerves 7 to 10 pairs, ascending, interarching at some distance from the margin; length 4·5 to 6 in., breadth 1·1 to 1·6 in., petiole ·5 to ·6 in. *Male panicles* from the branches below the leaves, lax, narrow and rather few-flowered, the lateral branches short, the rachis and branches pubescent at first but ultimately glabrescent, length 2·5 in. *Male flowers* globular, ·05 in. long; pedicels rufous-pubescent, about as long as the flowers; *perianth* coriaceous, rufous-puberulous externally, glabrous internally, 2 or 3-toothed; *andrœcium* ovoid-globular (or almost globular), not narrowed upwards; anthers about 12, attached by their backs only and easily separable, their margins and apices free. *Female flowers* in short axillary racemes or imperfect panicles shorter than the leaf-petioles, few-flowered, softly rufous-tomentose externally, as are the pedicels and rachis; *perianth* small, about ·03 in. in diam., globose, shortly 3-toothed; *ovary* globose, pubescent; stigma sessile, small, bifid. *Fruit* (ex Griffith MSS. quoted in *F. B. Ind.* v. 109) "racemed, the size of a cherry, pedicel ·5 in.; pericarp thick, with a deep longitudinal furrow; aril white, as long as the seed."

Malacca; *Griffith* (*Kew Distrib.*) No. 4356. Penang, *Curtis* Nos. 2406, 2458.

An imperfectly known species near *M. Farquhariana*, Wall., and *M. Forbesii*, King; but distinguished at once from both by its much smaller, globular, male flowers.

Plate 135. Myristica Griffithii, *Hook. fil.* 1, Branch with panicles of male flowers—*of natural size;* 2, male perianth; 3, andrœcium—*enlarged.*

32. Myristica Farquhariana, *Wall. Cat.* 6795. A tree 60 to 80 feet high; young branches slender; at first rusty-puberulous, afterwards paler, often slightly lenticellate. *Leaves* coriaceous, glabrous, lanceolate or oblong-lanceolate, rarely slightly oblanceolate, acuminate; the edge recurved when dry, the base cuneate; upper surface shining, brown when dry; the lower pale, purplish-brown, glaucous; main nerves 6 to 10 pairs, usually very indistinct, not interarching or only very slightly; length 3 to 6 in., breadth ·8 to 1·75 in.; petiole ·25 to ·5 in. *Male panicles* axillary, but mostly from the axils of fallen leaves, spreading, 1 to 1·5 in. long and 1 in. broad, rusty-puberulous. *Flowers* ovoid, inflated, ·1 in. long, in clusters of 6 to 10 and on pedicels slightly longer than themselves; *perianth* thinly coriaceous, 3 to 4-toothed, the teeth triangular-acute; outside puberulous; inside with numerous vertical lines of minute hairs; *andrœcium* cylindric, sessile, not apiculate, rather truncate, hardly more than half as long as the perianth; anthers 7 to 9, narrow, elongate, not twisted, only partially conjoined by their connectives, their apices and edges quite free, the cells sub-divergent. *Female panicles* shorter than the male, few-flowered, flowers reflexed, the *perianth* like the male but with sharper teeth; *ovary* sessile, ovoid-globose, tomentose; stigma sessile, transversely 2-lobed. *Fruit* in woody racemes of 2 to 5, ovoid, ·6 to ·75 in. long, slightly pointed at each end, faintly grooved on one side and ridged on the other, rufous-pubescent, becoming glabrous with age; peduncle ·35 to ·5 in., stout; pericarp coriaceous; arillus thin, extending to the apex of the seed, narrowly laciniate from base to apex; *seed* ellipsoid, mottled, smooth. *Hook. fil. & Thoms. Fl. Ind.* 161; *Hook. fil. Fl. Br. Ind.* v. 108; *A. DC. Prod.* xiv. 1, 200; *Miq. Fl. Ind. Bat.* i. *pt.* 2, *p.* 63 (*all in part*).

Singapore: *Wallich*, *Cantley* No. 41, *Ridley*. Malacca: *Harvey*, *Maingay* (*Kew Distrib.* Nos. 1290, 1293, 1302, 1303, 1306), *Ridley*. Penang: *Curtis* Nos. 487 & 804. Perak: common at elevations under 500 feet.

Var. major, *King*. Young branches rather darker coloured than in the typical form; leaves 5 to 7 in. long, larger than the typical form and more glaucous beneath, the nerves more distinct on the lower surface; male panicles rather longer (2·5 to 3 in.); the flowers larger (·15 in. long); fruit larger (·75 to 1 in. long), and scarcely ridged on the side opposite the groove.

Malacca: *Griffith* (*Kew Distrib.* No. 4355). Perak: *King's Collector* Nos. 6548, 6622, 6736 & 7928; *Wray* Nos. 2399 & 2695.

The variety may possibly be a distinct species, but the male flowers are so like those of true *M. Farquhariana*, Wall., that it seems desirable to consider it as a variety. The female flowers, when found, may possibly afford some specific character. As regards leaves, the variety forms a connecting link with the little-known species *M. Griffithii*, Hook. fil.

Plate 136. Myristica Farquhariana, *Wall.* 1, Branch with panicles of male flowers; 2, female panicle; 3, twig with ripe fruit; 4, section of fruit showing arillus and seed in fruit of variety *major—of natural size;* 5, male flowers; 6, androœcium; 7, female flowers; 8, ovary—*enlarged.*

33. Myristica Forbesii, *n. sp. King*. A tree 40 to 70 feet high; glabrous in all parts, except the rufous-tomentose leaf-buds and puberulous panicles and flowers; young branches rather slender, pale brown. *Leaves* thinly coriaceous, oblong-lanceolate, oblong to elliptic, acuminate, the base cuneate, both surfaces tinged when dry with purplish-brown; the upper shining, the lower pale, glaucous; main nerves 13 to 17 pairs, thin but distinct beneath, sub-horizontal to ascending, interarching within the margin; length 6 to 10 in., breadth 2 to 4 in.; petiole about ·5 in. *Male panicles* axillary or in the axils of fallen leaves, spreading, 2 to 2·5 in. long and about the same breadth. *Flowers* pedicellate, in sub-globular clusters, ovoid, ·15 in. long; pedicels about as long; *perianth* with 3 ovate sub-acute teeth; *andrœcium* sessile, ovate, blunt or sub-quadrangular and truncate; anthers from 6 to 10, quite free at the apex and sides; the cells narrow, distinct, twisted. *Female panicles* condensed, fewer-flowered than the male and not more than 1 in. long, scurfy-pubescent inside; teeth of *perianth* acute; *ovary* sessile, ovoid, scurfy-pubescent, the stigma oblique. *Fruit* in racemes of 3 to 12, when young sub-globular, when ripe narrowly obovoid, grooved, slightly scurfy, ·75 in. to 1 in. long; peduncle rather stout, thickened upwards, ·35 in. long; pericarp coriaceous; arillus extending to the apex of the seed, thin, pale, fleshy, divided to the base into many narrow segments; *seed* smooth, ellipsoid or slightly obovoid.

Malacca: *Maingay* No. 1295 (*Kew Distrib.*) Penang: *Maingay* (*Kew Distrib.*) No. 1293. Perak: common at elevations up to 800 feet. Singapore, *Ridley*. Distrib.—Sumatra: *Forbes* No. 2976 (♀).

This is closely allied to *M. Griffithii*, Hook. fil., and to *M. Farquhariana*, Wall.; but it has larger leaves, of thinner texture, which dry of a more purplish-brown colour,

and have more numerous, more prominent, spreading nerves, which leave the midrib at a less acute angle. An unnamed species from New Guinea (*Forbes* Nos. 329 & 375) also approaches this very closely.

Plate 137. Myristica Forbesii, *King*. 1, Branch with male panicles; 2, panicle of female flowers; 3, raceme of young fruit; 4, raceme of ripe fruit; 5, section of fruit; 6, arillus covering seed—*of natural size*; 7 & 8, male flowers dissected and showing the androecium; 9, female flower; 10, ovary—*enlarged*.

34. Myristica Canarica, *Bedd. MSS.* A tree; young branches cinereous, rather rough and sparsely lenticellate, the youngest minutely rufous-pubescent. *Leaves* thinly coriaceous, almost membranous, elliptic to oblong, acute or shortly acuminate, base rounded, sometimes slightly cordate or cuneate; both surfaces glabrous, the upper shining, the lower glaucous; main nerves 11 to 13 pairs, spreading, inconspicuous on the upper; thin but rather prominent on the lower surface, interarching within the margin; length 6 to 12 in., breadth 1·5 to 4·25; petiole ·3 to ·6 in. *Male panicles* axillary, spreading, 3·5 to 4 in. long and about as many broad; minutely and scurfily rufous-pubescent; *perianth* clavate or narrowly obovoid, ·15 in. long, minutely pubescent on both surfaces, cut for about a fourth of its length into 3 or 4, short, sub-acute, triangular teeth; pedicels about as long as the flowers. *Androecium* sessile, ellipsoid, blunt, much shorter than the perianth; anthers from 8 to 10, slightly unequal, narrow. *Female flowers* in racemes or imperfect panicles, about ·5 in. long; the rachis woody, stout; *perianth* sessile or sub-sessile, narrowly obovoid in bud, puberulous outside, tomentose inside, cut half-way down into three blunt recurved teeth; *ovary* sessile, ovoid-globose, pubescent; stigma sessile, divided by a mesial groove into two semi-lunar narrow, wavy lobes. *Fruit* (fide Beddome) globose, 1 to 1·25 in. in diam., glabrous in age. *Beddome Fl. Sylvatica*, *t.* 270 (*excl. syn. Wall. Cat.* 6798). M. Farquhariana, *A. DC. Prod.* xiv. 1, 200 (*in part*); *Hook. fil. & Thoms. Fl. Br. Ind.* 161; *Hook. fil. Fl. Br. Ind.* v. 108 (*both in part*).

Forests of Canara, Coorg, and the Wynaad—*Beddome*.

Plate 138. Myristica Canarica, *Bedd.* 1, Branch with male panicle; 2, twig with female racemes; 3, ripe fruit—*of natural size*; 4, male flower; 5, androecium; 6, female flower; 7, ovary; 8, stigma—*enlarged*. (*No.* 3 *is copied from Beddome's Fl. Sylvat.*, *t.* 270.)

Sect. IV.—Irya (*Hook. fil. & Thoms.*) *Panicles* as in *Pyrrhosa*; *perianth* bifid or 3-toothed, sometimes 4-toothed; *androecium* globose or depressed-globose, sessile, sometimes elongated transversely; the *anthers* for the most part attached to the column by their bases only (quite connate to it in No. 35), their sides and apices quite free, the apices sometimes much incurved. *Fruit* as in *Pyrrhosa*.

35. Myristica bivalvis, *Hook. fil. Fl. Br. Ind.* v. 107. A glabrous tree, 30 to 50 feet high; young branches cinereous, rather rough, lenticellate. *Leaves* thinly coriaceous, oblong or narrowly elliptic-oblong, acute or shortly acuminate, the base cuneate, dark greenish-brown above when dry, pale brown beneath; main nerves 11 to 13 pairs, spreading, rather straight with curving evanescent tips, thin, not prominent; length 7 to 10 in.; breadth 2 to 2·5 in.; petiole ·5 in. *Male panicles* axillary, spreading,

3 to 5 in. long and 3 to 3·5 in. broad, much-branched, many-flowered, quite glabrous. *Flowers* pedicellate, ·15 in. broad, inflated, transversely ovate, broader than long, compressed, boldly 2-valved; pedicel as long as the perianth. *Andrœcium* a laterally-compressed, sessile, flattened, 2-lobed cup, bearing about 30 elongate linear anthers, connate from base to apex, each lobe completely inflexed about the middle. *Female flowers* and *ripe fruit* unknown.

Singapore; *Murton*, *Ridley;* Malacca, *Ridley*.

A species readily distinguished from any described in this paper by its broad, compressed, 2-lipped perianth, with the anthers connate into two inflexed masses. An allied species from Banda (Bangka ?) is cultivated in the Botanic Garden, Buitenzorg; but the anthers in it are more numerous and they are inflexed only when young. A specimen collected by De Vriese in Amboina (kindly contributed to the Calcutta Harbarium by the authorities of the Leiden Herbarium) agrees with this in leaves and male flowers, except that the latter are rather smaller. That specimen bears the name *M. globularia*, Bl.; but I venture to think that it is wrongly so named (*M. globularia* being figured by Blume in *Rumphia* 1, *t.* 6, *fig.* 2, with globular flowers), and that it is really referable to *M. bivalvis*.

Plate 139. Myristica bivalvis, *Hook. fil.* 1, Branch with male panicles—*of natural size;* 2 & 3, male flowers unopened; 4, valves of perianth opened up, the andrœcium taken out; 5, andrœcium, side view; 6, half of the andrœcium seen from inside; 7, vertical section of andrœcium to show the incurving of the edges of its two halves—*enlarged*.

36. Myristica crassifolia, *Hook. fil. & Thoms. Fl. Ind.* 160. A tree; young branches thick, dark-coloured and rather rough. *Leaves* coriaceous, glabrous, elliptic-oblong, rather widest in the lower half, obtuse, the base slightly and suddenly cuneate; upper surface dull, greenish when dry; lower brown, dull, sub-glaucous; main nerves 11 to 13 pairs, rather prominent beneath, half-ascending, little curved, interarching near the margin; length 6·5 to 8·5 in., breadth 3 to 3·5 in.; petiole ·75 in., stout. *Male panicles* axillary or from axils of fallen leaves, branching from the base, rufous-tomentose, 2·5 to 5 in. long and 2 to 2·5 in. in diam. *Flowers* numerous, ·03 in. in diam., sub-globular, slightly compressed, glabrous, in rather dense clusters on the panicles; pedicels as long as the flowers; *perianth* thin, 2-valved; *andrœcium* sessile, flattened, elongated transversely; anthers 10, only partially attached to the column and to each other, ovate, compressed, opening by vertical elongated sutures. *Female flowers* and *fruit* unknown. *Hook. fil. Fl. Br. Ind.* v. 108; *A. DC. in Prod.* xiv. 1, 204. M. Irya, var. crassifolia, *Miq. in Herb.* M. Horsfieldii, *Blume*, ? *Wall. Cat.* 6806 (*in part*).

Malacca; *Griffith* (*Kew Distrib.* No. 4550), *Cantley*. Singapore; *Wallich*, *Anderson*, *Ridley*. Distrib.—Borneo, Bangka, Amboina, *De Vriese*.

Plate 140. Myristica crassifolia, *Hook. fil. & Thoms.* 1, Branch with male panicles—*of natural size;* 2, male flower; 3 & 4, andrœcium—*enlarged*.

37. Myristica Irya, *Gærtn. Fruct.* i. 195, *t.* 41. A tree 30 to 40 feet high; youngest branches rather stout, dark-coloured; the older glabrous, rather pale, often lenticellate, striate, two of the striæ on opposite sides of the branches much elevated. *Leaves* membranous, glabrous, oblong-lanceolate, acuminate; the base cuneate; upper surface dull greenish-brown when dry; the lower of a paler brown, not greenish; nerves 9 to 13 pairs,

slender, spreading; length 5·5 to 8 in., breadth 1·7 to 2·5 in.; petiole about ·35 in. *Male panicles* axillary, 2·5 to 4 in. long, glabrous or often minutely rufous-pubescent towards the apex, much-branched, many-flowered, the flowers glomerulate. *Flowers* ·05 in. in diam., sub-globose, or sub-obovate, slightly or much compressed, usually glabrous; pedicels as long as the flowers; *perianth* thin, 2-valved; *andræcium* broadly obovate, flat-topped, slightly elongate transversely; anthers about 10, free except at the base, elongate-ovate, 2-celled, their apices slightly incurved when young. *Female panicles* much smaller than the male (1·5 to 2 in. long and about 1·5 in. broad); the flowers fewer and larger; *perianth* slightly obovoid, blunt, glabrous, thick, 2-valved; *ovary* sessile, globular, ovoid, glabrous; stigma small, subterminal. *Fruit* solitary or in scanty racemes, globular, about ·9 in. in diam., glabrous; pericarp thick, coriaceous; arillus thin, fleshy, red, completely enveloping the perfectly spherical seed, entire or slightly toothed at the very apex, the teeth overlapping. *Hook. fil. & Thoms. Fl. Ind.* 159; *Hook. fil. Fl. Br. Ind.* v. 109; *A. DC. in Prod.* xiv. 1, 202 (*excl. syn.* M. exaltata, *Wall.*, from the foregoing); *Thwaites Enum. Pl. Cey.* 11; *Miq. Fl. Ind. Bat.* i. *pt.* 2, *p.* 64; *Bedd. For. Man.* 176; *Miq. Fl. Ind. Bat.* i. *pt.* 2, 64; *Kurz Fl. Burm.* ii. 282. M. Javanica, *Bl. Bijdr.* 576, & *Rumphia* i. 190, *t.* 62.

Ceylon; *Thwaites C. P.* 2620, *Trimen.* Penang, *Curtis* No. 936. Malacca; *Griffith* No. 4357, *Maingay* No. 1292. Singapore and Pahang, *Ridley.* Perak, *Scortechini.* Distrib.—Malayan Archipelago.

There is no doubt that the nutmeg to which Gærtner gave the name *M. Irya* was a Ceylon plant. The specific name is as near as may be to the vernacular name still current for it in that island; and the only locality he quotes for the species is Ceylon. The Ceylon plant is therefore, presumably, exactly Gærtner's *M. Irya.* The only specimens which I have seen from any other source which in every particular agree with Ceylon specimens are from Penang (*Curtis* No. 936). The species, or a plant or plants which it has hitherto been impossible to separate from it, is however found in Burmah, the Malayan Peninsula, and in the Andaman Islands; apparently also it extends to the Malayan Archipelago. This is an unusually wide distribution for a member of this genus, and, as might be expected, there is some amount of variety of form. Two of the forms I describe as varieties thus:—

Var. longifolia, *King.* Leaves oblong-lanceolate, 8 to 11 in. long; nerves 18 to 21 pairs. M. Vrieseana, *Miq. Ann. Mus. Lugd. Bat.* ii. 49.

Malacca; *Maingay* (No. 1291, *Kew Distrib.*) Perak, *Scortechini* No. 1738; *King's Collector* No. 7447. Great Coco Island; *D. Prain.* S. Andaman, *Kurz.* Distrib.—Bœrœ, Borneo.

Var. Wallichii, *King.* Leaves acuminate, much narrowed at the base; fruit slightly apiculate; arillus shortly toothed at the apex. Myristica sphærocarpa, *Wall. Pl. As. Rar.* i. *t.* 89; *Wall. Cat.* 6796.

Burmah, *Wallich, Kurz.*

There is at Calcutta, thanks to the kindness of the authorities of the Leiden Herbarium, one of the specimens of De Vriese on which Miquel founded his species *M. Vrieseana*, and there is no doubt whatever that it is *M. Irya*, Gærtn., var. *longifolia.*

Plate 141. Myristica Irya, *Gærtn.* 1, Branch with male panicles; 2, branch with ripe fruit; 3, ripe fruit dehiscing and showing the seed and arillus; 4, seed with the arillus removed—*of natural size;* 5 & 6, male flowers; 7, male flower opened up and seen from above; 8, section of male flower showing the androecium; 9, anthers; 10, female flowers; 11, section through female flower showing ovary; 12, apex of ovary, showing stigma; 13, vertical section through ovary—*enlarged.*

Plate 141 *bis.* Myristica Irya, *Gærtn.*, var. longifolia. 1, Branch with male panicles; 2, female panicles, var. *Wallichii;* 3, leaf; 4, cluster of ripe fruit; 5, seed and toothed arillus—*all of natural size.*

From original drawings made from Ceylon specimens and kindly lent to me by Dr. Trimen, F.R.S., Director of the Royal Botanic Garden, Peradeniya.

38. Myristica glabra, *Blume Bijdr.* 576. A tree 40 to 50 feet high; all parts quite glabrous; young branches rather stout; the bark cinereous, rough, the tips dark-coloured, slightly scurfy. *Leaves* thinly coriaceous, elliptic-oblong, usually slightly obovate, acute or sub-acute, often much narrowed in the lower third to the acute base; nerves 9 to 14 pairs, rather faint; length 5 to 7 in., breadth 2 to 3 in.; petiole ·5 to 1 in. *Male panicles* from the axils of fallen leaves, 3 to 3·5 in. long and nearly 2 in. broad, many-flowered. *Flowers* globular, glabrous, less than ·1 in. in diam.; pedicels as long as or longer than the flowers; *perianth* thin, bifid or with 3 broadly triangular teeth. *Andrœcium* ovate or sub-globular, sessile; anthers about 10, linear, free at the sides and apices, convex. *Female flowers* unknown. *Fruit* ovoid or ellipsoid, glabrous, grooved on one side, 1·25 to 1·5 in. long; pericarp rather thick; arillus orange, thin, fleshy, entire, completely enveloping the ovoid smooth seed. *Blume Rumphia* 1, 191, *t.* 64, *fig.* 1 *A. & B.; H. f. & T. Fl. Ind.* 161; *A. DC. in Prod.* xiv. 1, 202 (*excl. syn.* M. integra, *Wall. Cat.* 6799); *Miq. Fl. Ind. Bat.* i, *pt.* 2, *p.* 65; *Hook. fil. Fl. Br. Ind.* v. 107. M. amygdalina, *Kurz* (*not of Wall.*) *For. Fl. Burm.* ii. 283. M. Kurzii, *King MSS.*

Burmah, *Kurz.* S. Andaman, *King, Collectors of Calcutta Garden.*

Plate 142. Myristica glabra, *Blume.* 1, Branch with male flowers; 2 & 3, branches with ripe fruit—*of natural size;* 4, 5 & 6, male flowers; 7 androecium—*enlarged.*

39. Myristica majuscula, *n. sp. King.* A tree 40 to 70 feet high; young branches as thick as a goose quill, minutely warted, puberulous at the tips, ultimately glabrous. *Leaves* glabrous, coriaceous, elliptic, acute or sub-acute, usually narrowed in the lower fourth to the cuneate base; upper surface pale, greenish-brown when dry, dull; the lower pale, bright brown; nerves 10 to 12 pairs, spreading, interarching ·1 in. from the slightly recurved margin, rather prominent beneath, minutely and sparsely scurfy-puberulous at first, but ultimately quite glabrous; length 7 to 10 in.; breadth 2·5 to 3·5 in.; petiole ·5 to ·75 in. *Male panicles* from the axils of fallen leaves, wide at the base and narrowing upwards, much branched, lax, the main rachis rather stout, 3·5 in. long and 2·5 in. wide at the base; *flowers* rather few, buds globose, rather under ·1 in. in diam., shorter than the pedicel, rather scurfy; *perianth* leathery, glabrous, with 3, sometimes 4, triangular teeth. *Andrœcium* almost sessile, sub-depressed, sharply trigonous; anthers 13, narrow, elongate, their sides conjoined, their apices free. *Female flowers* unknown. *Fruit* on the branches below the leaves, in pairs or solitary, broadly ovoid, blunt, slightly pointed when young, glabrous, 1·75 in. long by about 1·35 in. in diam.;

pericarp thickly leathery; arillus fleshy, entire, covering the whole seed, overlapping at the apex. *Seed* ovoid, faintly reticulate, smooth.

Perak: at elevations of from 300 to 2,000 feet, *King's Collector* Nos. 5059, 6004, 7965 & 10413; *Wray* Nos. 2218, 2705. Singapore, ? *Hullett.*

Plate 143. Myristica majuscula, *King.* 1, Leaf-twig; 2, male panicle; 3, young fruit; 4, ripe fruit; 5, section of ripe fruit; 6, arillus covering seed—*of natural size;* 7, male flower; 8, androecium—*enlarged.*

40. Myristica brachiata, *n. sp. King.* A spreading tree, 80 to 100 feet high; young branches rather stout, prominently 2-ridged, lenticellate, glabrous. *Leaves* thinly coriaceous, glabrous, oblong-lanceolate, shortly acuminate, the base acute; both surfaces rather dull, the upper olivaceous, the lower brown (when dry); main nerves 15 to 20 pairs, thin but prominent beneath, spreading; length 7 to 11 in., breadth 2·75 to 4 in.; petiole ·25 in. *Male panicles* from the axils of leaves or of fallen leaves, slender, much-branched, spreading, 4 to 6 in. long and about as many broad, glabrescent. *Male flowers* about ·05 in. in diam., obovate-globular, glabrous; *perianth* leathery, its teeth 3, triangular. *Androecium* sessile, sharply trigonous; anthers about 9, slightly conjoined by their sides, the apices quite free, their cells very distinct. *Female panicles* shorter and stouter and much fewer-flowered than the males, 3·5 to 5 in. long; their branches puberulous towards their tips, glabrous below. *Flowers* larger than the males, nearly ·1 in. long, ovoid, glabrous; *perianth* rather thick, 2 or 3-toothed; *ovary* sessile, broadly ovoid, sub-compressed, ridged in one side; stigma very short, oblique, slightly 2 lobed. *Fruits* 6 to 8 in woody spreading cymes from below the leaves, ovoid, glabrous, 1·25 in. long and ·9 in. in diam.; pedicels ·25 in. long; pericarp rather thinly coriaceous; arillus covering the whole of the seed, slightly laciniate and overlapping at the apex; *seed* ovoid, smooth.

Singapore; *Wallich.* Perak, *King's Collector* Nos. 4704 & 6771; *Scortechini* No. 1649. Malacca, *Griffith* (*Kew Dist.*) No. 4351. Perak, *King's Collector* Nos. 4704, 6771 & 7447; *Scortechini* No. 1649.

This species is readily distinguished by its 2-ridged young branches and large cymes of ovoid fruit. This is one of the plants mixed up by Wallich in his No. 6806, and issued under the name of "M. Horsfieldia, *Bl.* (?)," which it does not much resemble. The other species thus mixed are (*fide F. Br. Ind.* v. 106) *M. Wallichii*, Hook. fil. & Thoms., and *M. polyspherula*, Hook. fil.

Plate 144. Myristica brachiata, *King.* 1, Branch with panicle of male flowers; 2, panicle of female flowers; 3, panicle of ripe fruit; 4, ripe fruit; 5, arillus covering seed—*of natural size;* 6, male flower; 7, androecium; 8, female flower; 9, ovary—*enlarged.*

41. Myristica Ridleyana, *n. sp. King.* A tree 40 to 60 feet high; glabrous, except the panicle and leaf-buds; young branches slender, dark-coloured. *Leaves* thinly coriaceous, lanceolate, acuminate; the base cuneate; when dry the upper surface greenish, the lower bright brown; main nerves 7 to 10 pairs inconspicuous, spreading; length 3 to 5 in., breadth 1 to 1·5 in.; petiole ·4 to ·5 in. *Male panicles* from the axils of leaves or of fallen leaves, about 1·25 in. long, spreading, scurfy or almost glabrous. *Flowers* depressed-globose, ·05 in. in diam., glabrous, slightly scaly; pedicels longer than the flowers; *perianth* with 3 or 4 broadly triangular, acute teeth; *andrœcium* sessile, with 7 or 8 broadly-ovate sub-erect anthers attached by their bases (almost as in *Knema*), their apices and margins free.

Female racemes less than ·75 in. long; *flowers* globose, coriaceous, glabrous; the teeth short, blunt, gaping; *ovary* sessile, globose, glabrous, grooved; stigma slightly oblique, small, grooved. *Fruit* solitary or in short racemes of 2 to 4, ellipsoid; length (when young) ·5 in., pedicel ·2 in., stout; pericarp leathery, glabrous, thick; arillus thin, quite entire, and completely enveloping the smooth oval seed.

Perak: at elevations from 600 to 800 feet, *King's Collector* No. 10917; *Scortechini* No. 862. S. Ujong, *Cantley* No. 1798.

Allied to *M. polyspherula*, Hook. fil., but with smaller, quite glabrous leaves, with fewer, fainter nerves, a different ovary, and ellipsoid fruit.

PLATE 145. Myristica Ridleyana, *King*. 1, Branch with male flowers; 2, branch with female flowers; 3 & 4, young fruit; 5, arillus covering seed—*of natural size;* 6, androecium; 7, ovary—*enlarged*.

42. MYRISTICA POLYSPHERULA, *Hook. fil. Fl. Br. Ind.* v. 108. A tree 40 to 50 feet high; young shoots rather slender, at first covered with rusty scurf, ultimately glabrous and striate. *Leaves* narrowly oblong, or oblong-lanceolate, acute or acuminate, the edge slightly revolute when dry; the base cuneate, rarely rounded; upper surface pale greenish-brown when dry, glabrous, shining; the lower dark brown, dull, glabrous, except the midrib which in young leaves is scurfy-puberulous; main nerves 11 to 13 pairs, thin but sharp and bold on both surfaces, spreading, the ends interarching ·1 in. from the edge; length 3·5 to 6 in., breadth 1·5 to 2·25 in.; petiole ·35 to ·5 in. *Male panicles* from the axils of leaves and of fallen leaves, much-branched, spreading, densely rusty-tomentose, 2 to 4 in. long and 1·5 to 3 in. broad; *flowers* clustered towards the ends of the branchlets, ·05 in. in diam., depressed-globose, glabrous; *perianth* black when dry, leathery, with 3 or 4 triangular acute teeth, sometimes only 2-valved; pedicels about as long as the flower; *androecium* sessile, transversely elongate or slightly 3 or 4-cornered, according to the number of perianth segments; anthers 9 to 12, ovate, the cells divergent, and the sides and apices free. *Female panicles* only about 1·5 in. long, stout, few-flowered; *perianth* ovoid, blunt, very thick, glabrous, with 3 sub-acute, concave teeth; *ovary* sessile, compressed, ovoid, glabrous; stigma grooved, sub-bi-lobed. *Fruit* in short racemes of 2 or 3, pedunculate, ovoid, narrowly ridged on one side, glabrous, about ·75 in. long and ·5 in. in diam.; peduncles ·25 to ·5 in. long; pericarp leathery, splitting into 2 valves when ripe; arillus rather fleshy, entire, completely covering the broadly ovoid, smooth, shining seed. M. globularia, *Hook. fil. & Thoms.* (*not of Blume*) *Fl. Ind.* 160; *A. DC. in Prod.* xiv. 1, 202 (*in part*). M. Horsfieldia, *Bl.* ? *Wall. Cat. in part* (*not of Blume*).

Malacca; *Griffith* (*Kew Distrib.*) No. 4351, *Cantley*. Singapore, *Ridley*. Perak; *King's Collector*, *Scortechini*, *Wray*, at low elevations; common.

The leaves of this when dry are brittle, and have an olivaceous tint on the upper surface, the lower being of a bronze-like brown. It much resembles the only authentic specimen which I have seen (♂ only) of *M. subglobosa*, Miq.

PLATE 146. Myristica polyspherula, *Hook. fil.* 1, Branch with male flowers; 2, ripe fruit; 3, section of ripe fruit; 4, arillus covering the seed—*of natural size;* 5, male flower; 6, androecium; 7, female flower; 8, ovary—*enlarged*.

43. MYRISTICA COLLETTIANA, *n. sp. King*. A tree 30 to 70 feet high; young branches brown, faintly lenticellate, striate, glabrous when old, scurfy rusty-pubescent when young.

Leaves elliptic-oblong, acute or acuminate, narrowed in the lower third to the acute base, the edges slightly recurved; upper surface pale, dull, olivaceous brown when dry, glabrous; the lower reddish-brown, glabrous, except the deciduously pubescent midrib; main nerves 13 to 17 pairs, prominent on both surfaces, but especially on the lower, spreading and forming double intermarginal arches; length 6 to 8 in., breadth 2 to 3 in.; petiole ·35 to ·5 in., stout. *Male panicles* axillary, lax, spreading, 2·5 to 3·5 in. long and about 1·5 in. broad; the axis and branches slightly scurfy-pubescent (never tomentose), the pedicels and flowers quite glabrous; buds depressed-globose or sometimes obovoid, less than ·05 in. in diam., the pedicels longer; *perianth* leathery, pale, quite glabrous on both surfaces, with 3 acute triangular teeth; *androecium* transversely ovoid, compressed or 3-angled, the disc small, concave; anthers about 10, erect, rather short, narrow, attached by their bases only, their sides and apices quite free, the connectives sometimes produced into a short appendage at the apex. *Female panicles* about 1 in. long, sub-glabrous, slightly scurfy when very young; pedicels rather thick, recurved; flowers sub-globular, ·05 in. in diam.; the *perianth* fleshy, glabrous; shortly 3-toothed; *ovary* depressed-globular, glabrous; stigma small, oblique. *Fruit* solitary or in racemes of 2 or 3, broadly ovoid, glabrous; 1·25 to 1·5 in. long and 1 to ·25 in. broad; pericarp leathery, ·25 in. thick, splitting when ripe into 3 or 4 valves; arillus rather thick, entire, covering the whole of the smooth globose seed. M. glabra, *Blume*, VAR. Sumatrana, *Miq. Ann. Mus. Lugd. Bat.* ii. 49.

Malacca; *Maingay* (*Kew Distrib.*) No. 1286, *Cantley*. Perak; *King's Collector* Nos. 3620, 3899, 6672, 6737.

This is closely allied to *M. polyspherula*, Hook. fil., from which, however, it differs in its nearly glabrous panicles and very much larger fruit. I have dedicated this species to that distinguished soldier and botanist Brigadier-General H. Collett, C.B., who has recently done so much to increase our knowledge of the Flora of Upper Burmah.

PLATE 147. Myristica Collettiana, *King*. 1, Branch with panicles of male flowers; 2 & 3, fruits; 4, seed covered by arillus—*of natural size;* 5, male flower; 6, androecium—*enlarged*.

Sect. V.—KNEMA (*Blume, Hook. fil., & A. DC.*) *Male flowers* pedicelled, in clusters of from 3 to 15, from axillary tubercles, each pedicel with a persistent bracteole about the middle (close to the perianth in *M. Cantleyi* and *M. oblongifolia*). *Staminal column* usually stalked, peltate, discoid, concave, flat or convex; the *anthers* ovate, usually sessile, attached by their bases to its edge, otherwise free, rarely with filaments, radiating, more or less horizontal and dehiscing downwards, or sub-erect and extrorse.

44. MYRISTICA OBLONGIFOLIA, *n. sp. King*. A shrub, or small tree 30 to 40 feet high; young branches slender, at first minutely scurfily rufous-tomentose; afterwards sub-glabrous, the bark pale brown. *Leaves* thickly membranous, oblong-lanceolate or oblanceolate or oblong, rarely elliptic, apex acute or shortly acuminate, very gradually narrowed to the cordate or emarginate base; upper surface glabrous, shining; lower pale, dull; when young with much loose stellate rufous hair, when adult sub-glabrous, the midrib prominent below, as are the 20 to 28 pairs of spreading nerves, which

curve upwards and interarch inside the margin; length 6 to 15 in., breadth 1·5 to 4 in.; petiole ·25 to ·75 in., stout, rufous-tomentose when young. *Male flowers* in 6 to 8-flowered umbels from short axillary tubercles, elongated in VAR. *monticola;* buds ·15 in. in diam., oblong-obovoid; pedicels ·25 to ·35 in. long, almost sessile in VAR. *monticola;* the bracteole minute, sub-orbicular, close to the base of the flower; *perianth* lobes obovate, blunt or sub-acute, thick, concave, outside minutely rufous. stellate-hairy like the pedicel, inside glabrous, ridged; *staminal disc* very small, slightly concave, orbicular, sub-3-angled, lobed, glabrous; anthers 6 to 10, sessile, sub-erect; stalk cylindric, as long as the perianth tube. *Female flowers* sessile, in shortly but stoutly pedunculate 4 to 6-flowered axillary umbels; buds ovoid, lobes of *perianth* ovate, blunt, externally rufous stellate-tomentose; internally glabrous; *ovary* sessile, ovoid-conic, rusty-tomentose, style shorter than the ovary, cylindric, glabrous; stigma of 2, rounded, compressed, erect lobes. *Fruit* in pairs or solitary, axillary, shortly peduncled, sub-obovoid or ovoid, slightly pointed, slightly ridged, 1 to 1·5 in. long, ·75 to 1 in. in diam.; pericarp thin, dry, densely covered with harsh, short, rusty tomentum, often sub-glabrescent when old; peduncle ·2 in., stout; arillus thin, deeply-lobed, covering only the lower half of the mottled ovoid seed.

Perak, Penang: at elevations of 500 to 800 feet. Malacca, *Cantley*. Sungei Ujong, *Cantley*.

VAR. monticola, *King*. Leaves smaller (6 to 10 in. long), their bases sub-acute or rounded, nerves rather fewer (18 to 22), petioles longer (·5 to ·75 in.) and rather slender; male flowers almost sessile, on slightly elongated warted peduncles; stalk of staminal disc rather longer than in the typical form.

Perak: at elevations of 2,500 to 3,800 feet, *King's Collector, Scortechini, Wray*.

A variety found only in the hills. The anthers are arranged on a staminal column resembling that of *Irya*, but having a stalk as in *Eumyristica*.

PLATE 148. Myristica oblongifolia, *King*. 1, Branch with male flowers; 2, twig with ripe fruits; 3, section of fruit showing seed covered by arillus; 4, arillus; 5, seed—*of natural size;* 6, male flower; 7, androecium; 8, male flower of VAR. *monticola;* 9, androecium of *monticola;* 10, female flower; 11, ovary and stigma—*enlarged*.

45. MYRISTICA KUNSTLERI, *n. sp. King*. A tree 30 to 50 feet high; young branches slender, slightly and minutely rusty-tomentose at first, quickly becoming rather dark and glabrous. *Leaves* glabrous, thinly coriaceous, much reticulate when dry, elliptic or elliptic-oblong, sometimes ovate, shortly and rather bluntly acuminate or acute, occasionally obtuse, the base cuneate or rounded, slightly unequal; upper surface shining, pale greenish when dry, lower sub-glaucous, of a dull brownish white with numerous small brown dots, sub-lacunose, the lateral nerves and midrib prominent and brown, minutely scurfy; nerves 7 to 10 pairs, spreading, arching within the margin; length 3 to 7 in., breadth 1·5 to 3 in.; petiole ·5 to ·75 in. *Male flowers* in 4 to 12-flowered umbels from short, woody, axillary tubercles; pedicels ·3 to ·4 in., slender, the minute bracteole about the middle; buds ·1 to ·15 in. in diam., depressed-globose; segments of *perianth* fleshy, broadly-triangular, concave, glabrous within, minutely tomentose externally, as are the pedicels; *staminal disc* small, sub-rotund, obscurely 3-angled, flat,

glabrous; anthers 9 to 12 with filaments attached to edge of disc, short, ovate, horizontal, dehiscing downwards; stalk very short, cylindric. *Female flower* unknown; *ovary* (after fertilization) sessile, ovoid, narrowed above, rugulose; style very short, glabrous, stigma with 3 short conical spreading lobes. *Fruit* usually solitary, sometimes in clusters of 2 or 3, axillary, pedunculate, ·75 to 1 in. long by ·5 to ·75 in. in diam., broadly ovoid, slightly apiculate; the stigma persistent, slightly narrowed at the base, minutely rugulose and rufous-pubescent; pericarp thickly coriaceous; arillus thin, enveloping the fruit, slightly 5 or 6 lobed at the very apex.

Perak: at elevations of from 500 to 2,000 feet; common.

Plate 149. Myristica Kunstleri, *King*. 1, Branch with ripe fruit; 2, twig with male flowers; 3, arillus and seed—*of natural size;* 4, male flower; 5, staminal disc and anthers—*enlarged.*

46. Myristica conferta, *n. sp. King*. A tree 60 to 80 feet high; young branches rather stout, pale brown, striate, glabrous; the youngest densely covered with short, stellate, rusty tomentum. *Leaves* oblong or narrowly elliptic, acute; the base rounded or slightly cordate; both surfaces minutely reticulate; the upper glabrous, shining; the lower, when young, and especially the nerves, with minute loose scurfy tomentum, ultimately glabrescent and sub-glaucous; main nerves conspicuous below, about 15 to 20 pairs, spreading; length 5 to 7·5 in., breadth 1·75 to 2·25 in. *Male flowers* in densely crowded axillary clusters of 20 to 30; pedicels ·3 to ·4 in. long, tawny-pubescent, the bracteole about the middle. *Perianth* sub-globose, depressed, bluntly 3-angled; the teeth broadly triangular, acute, fleshy, concave, stellate-tomentose externally, glabrous within; *staminal disc* very concave at first; the anthers 15, with short filaments, at first erect and slightly recurved at the apex, afterwards radiating and sub-horizontal, and the disc flat; stalk cylindrical below, rapidly widening upwards into the disc, striate, minutely hairy, especially at the base. *Female flowers* larger than the males, but in smaller clusters, slightly obovoid; *perianth* with 3 short sub-acute teeth; *ovary* depressed-globose, rufous-tomentose; stigma sessile with 3 spreading acute lobes. *Fruit* axillary, solitary, ovoid, blunt, 1·5 in. long and about 1·1 in. in diam., shortly rufous-pubescent when young, glabrescent when ripe; pericarp rather dry, about ·2 in. thick, splitting vertically when ripe; *seed* ellipsoid, pointed; arillus covering the whole seed, minutely laciniate at the apex.

Perak: at low elevations; *King's Collector* Nos. 6211, 10295; *Wray* No. 2377. Malacca; *Griffith* No. 4345; *Maingay* Nos. 1294 & 1297. Singapore, *Ridley* No. 442.

Allied to *M. laurina*, Blume; but distinguished from that species by its more numerous stamens, 3-cleft sessile stigma, and larger glabrescent fruit.

Plate 150. Myristica conferta, *King*. 1, Branch with male flowers; 2, twig with female flowers; 3, twig with ripe fruit; 4, seed covered by its arillus; 5, apex of arillus—*of natural size;* 6, male flower; 7, androecium; 8, female flower; 9, ovary and stigma—*enlarged.*

47. Myristica Wrayi, *n. sp. King*. A tree 20 to 60 feet high; young branches slender, rather pale; all parts glabrous except the inflorescence. *Leaves* thinly coriaceous, narrowly elliptic or elliptic-oblong, acute or sub-acute, rarely sub-acuminate; the base rounded, sometimes emarginate or sub-cuneate, never cordate; upper surface shining; the lower dull, whitish grey; the midrib and 13 to 17 pairs of spreading

nerves prominent; length 6 to 9 in., breadth 2·25 to 3 in.; petiole ·5 to ·65 in. *Male flowers* in compound many-flowered umbels from short, woody, axillary tubercles; buds sub-globose, ·15 in. in diam., minutely pubescent or sub-glabrous externally, as are the pedicels; pedicels ·35 in. long, the bracteole above the middle; lobes of *perianth* broadly ovate, sub-acute, glabrous and ridged inside; *staminal disc* sub-triangular, sub-convex; anthers 13 to 17, on short filaments, horizontal; stalk very short, stout. *Female flowers* unknown. *Fruit* oblong-ovoid or ovoid, 1 to 1·75 in. long when ripe, in pairs, axillary, pedicellate, cinereous, glabrescent; pedicel ·25 in. long; arillus entire, thin, tough, completely enveloping the oblong-ovoid or ovoid seed.

Perak: at elevations up to 500 feet—*Wray*, *King's Collector*.

This has leaves rather like *M. Spanogheana*, Miq., but narrower, with fewer nerves and paler on the under surface.

Plate 151. Myristica Wrayi, *King*. 1, Branch with male flowers; 2, ripe fruit; 3, section of ripe fruit; 4, seed covered by its arillus—*of natural size;* 5, male flower; 6, staminal column and disc with anthers—*enlarged.*

48. Myristica attenuata, *Wall. Cat.* 6791. A tall tree; youngest branches and inflorescence covered with golden or tawny, furfuraceous, deciduous tomentum; ultimately glabrous and striate; slender. *Leaves* thinly coriaceous, flocculent-pubescent only when young, elliptic-oblong or elliptic-lanceolate, rarely elliptic, acute or acuminate; the base cuneate, sometimes rounded, often unequal; upper surface shining, glabrous; the lower pale, glaucous; lateral nerves 12 to 18 pairs, prominent, spreading; length 5 to 8 in., breadth 1·75 to 2·75 in.; petiole ·5 in. or under. *Male flowers* ·3 in. in diam., obovate-globose, in 3 to 6-flowered, shortly peduncled, axillary umbels; pedicels ·2 to ·4 in. long, slender, bracteolate above the middle; *perianth* deeply divided into 3 triangular, fleshy, concave segments, rufous-lanose externally, glabrous and striate within; *staminal disc* sub-concave, glabrous; anthers about 13, on short filaments, ovate, opening downwards; stalk of the disc cylindric, about as long as the perianth tube. *Female flowers* in umbels like the males, but fewer-flowered, sub-sessile or sessile, the bract close to the base of the perianth; *perianth* cylindric or narrowly ovoid, slightly gibbous at the base, 3-toothed, otherwise as in the male; *ovary* sessile, ovoid, densely tomentose; the style short, fleshy, glabrous, expanding above into the bi-lobed fleshy stigma, the lobes somewhat corrugated internally. *Fruit* 1 to 1·5 in. long, ellipsoid or sub-obovoid, abruptly and shortly pointed, densely rusty furfuraceous-tomentose, but ultimately sub-glabrous; arillus thin, uniform, entire, completely enveloping the narrowly ovoid seed. *Hook. fil. & Thoms. Flora Ind.*, 157; *A. DC. in Prod.* xiv. 1, 205; *Hook. fil. Fl. Br. Ind.* v. 110; *Dalz. & Gibs. Fl. Bombay*, 4. M. corticosa, *Bedd. Fl. Sylv.*, *t.* 271 (*not of Lour., nor of H. f. & Th.*) M. amygdalina, *Grah. Cat. Bomb. Plants*, 175 (*not of Wall.*)

Moist forests of the Western Ghâts; from South Canara to South Travancore, at elevations of from 1,000 to 3,000 feet.

Plate 152. Myristica attenuata, *Wall.* 1 & 2, twigs with female flower and young fruits; 3 to 5, female flowers; 6, ovary, style, and stigma; 7, young fruit; 8, ripe fruit; 9, piece of twig with male flowers; 10, male flower; 11, staminal disc. (*Nos.* 4, 5, 6, 10 & 11 *are enlarged; the others are of natural size. Nos.* 3, 4, 5, 7, 10 & 11 *are copied from Bedd. Fl. Sylv., t.* 271.)

49. Myristica Scortechinii, *n. sp. King.* A tree 40 to 60 feet high; young branches rather stout, covered at first with minute scurfy tomentum, afterwards rather pale brown and glabrous. *Leaves* coriaceous, narrowly oblong-lanceolate, alternate towards the acute apex, the base rounded and emarginate or minutely cordate, or sub-cuneate; upper surface shining, glabrous; lower, when young, densely covered with very minute, stellate or tawny deciduous tomentum; when adult sub-glabrous and rather pale; main nerves from 18 to 28 pairs, spreading, prominent below; length 7 to 12 in., breadth 1·75 to 2·5 in.; petiole ·3 to ·5 in., rusty-tomentose when young. *Male flowers* in 4 to 10-flowered umbels from usually short, woody, axillary tubercles; pedicels slender, ·35 to ·6 in. long; the minute bracteole about the middle, pedicel thinner above the bracteole; buds ·2 in. in diam., depressed-globular, obtusely 3-angled; *perianth* cleft nearly to its base, the teeth broad, triangular, minutely stellate-tomentose outside as are the pedicels, glabrous and striate within, very concave; *staminal disc* small, flat, 3-angled, glabrous; anthers 10 to 18, radiating horizontally, the filaments distinct, short; stalk of the disc cylindric, glabrous, ridged, thickened in its upper part. *Female flowers* unknown. *Fruit* 1 in. or more long when ripe, ovoid-globose, blunt, slightly ridged at the suture and slightly gibbous at the base on one side, pedicelled; when young densely and minutely rufous-tomentose, afterwards sub-glabrescent; pericarp thin; arillus thin, red, closely embracing the seed, irregularly lobed at the apex; *seed* ovoid-globose. M. laurina, *Bl.*, var. Borneensis, *Miq. Ann. Mus. Lugd. Bat.* ii. 51.

A species not unlike *M. intermedia*, Bl.; but at once distinguished by its flat (not mammillate) disc. It also resembles *M. furfuracea*, but its ripe fruit is more glabrescent, more globular and smaller, and the reticulations of its leaves are much more minute.

Perak: common at elevations from 500 to 1,500 feet, *Scortechini, Wray, King's Collector.* Malacca, *Derry.* Distrib.—Borneo.

Plate 153. Myristica Scortechinii, *King.* 1, Branch with male flowers; 2, ripe fruit; 3, apex of seed showing the lobed arillus; 4, base of cordate leaves—*of natural size;* 5 & 6, male flowers; 6, staminal disc and anthers; 7, ovary—*enlarged.*

50. Myristica intermedia, *Blume Rumph.* i. 187. A tree 40 to 70 feet high; branches slender, the youngest thinly covered with minute, scurfy, rufous tomentum, ultimately dark-coloured and glabrous. *Leaves* coriaceous, glabrous, narrowly oblong-lanceolate, tapering but little towards the acute or shortly acuminate apex, or towards the cuneate (rarely rounded or sub-cordate) base; upper surface shining; lower dull, pale; lateral nerves 12 to 22 pairs, spreading, rather prominent on both surfaces; length 5 to 12 in., breadth ·8 to 3 in.; petiole ·5 in., deciduously tomentose, like the young branches. *Male flowers* from short, rounded, woody tubercles in the axils of leaves or of fallen leaves, in umbels of 6 or 8; pedicels and outer surface of perianth minutely rufous-tomentose, sub-flocculent; bracteole small, above the middle of the ·4 in. long pedicel; the buds sub-globose, slightly pointed; *perianth* when expanded ·25 to 3 in. in diam.; its segments triangular-ovate, sub-acute, glabrous and striate inside. *Staminal disc* very convex (mammillate); anthers 12 to 15, sessile, radiating, their dehiscence downwards; stalk of disc very short, thickened towards the apex. *Female flowers* in axillary umbels like the males, but sessile and the bracteole close to the base of the flower; buds ovoid; lobes of *perianth* ovate, acute; *ovary* sessile, ovoid, minutely rufous-tomentose; stigma sessile,

broad, with 6 to 8 short, sub-erect, narrow lobes. *Fruit* usually solitary, rarely in clusters of 2 or 3, 1·25 to 1·75 in., ellipsoid, blunt, grooved on one side, covered with a thin layer of minute scurfy rufous tomentum; arillus thin, entire, or slightly laciniate towards the apex, completely enveloping the elongate sub-rugose seed. *Hook. fil. & Thoms. Fl. Ind.* 158; *Hook. fil. Fl. Br. Ind.* v. 112; *A. DC. in Prod.* xiv. 1, 206; *Miq. Fl. Ind. Bat.* i. *pt.* 2, 70. ? M. corticosa, *H. f. & T.*, VAR. decipiens, *Miq. Ann. Mus. Lugd. Bat.* ii. 51.

Malacca; *Griffith* (*Kew Distrib.*) 4359 (with diseased male flowers); *Maingay* 1281; *Cantley*. Penang, *Curtis*. Singapore; *Cantley*, *Lobb*, *Ridley*. Perak; *Scortechini*, *King's Collector*, *Wray*. Penang, *Curtis*.

The fruits of this are always, and the leaves are usually, larger than those of *M. glauca*, Bl. It is, however, at once distinguished from that and from every other *Knema* in those provinces, except *M. Cantleyi*, by the curious mammillate staminal disc.

PLATE 154. Myristica intermedia, *Blume*. 1, Branch with female flowers and ripe fruit; 2, twig with male flowers; 3, section of fruit showing arillus covering seed (slightly laciniate towards apex)—*of natural size;* 4, male flower; 5, staminal column and disc with anthers; 6, female flower; 7, ovary—*enlarged.*

51. MYRISTICA FURFURACEA, *Hook. fil. & Thoms. Fl. Ind.* 159. A tree 40 to 60 feet high; branchlets stout, the bark smooth, black and much cracked when old; when very young densely covered by a thick layer of scurfy, tawny or rusty tomentum. *Leaves* coriaceous, glabrous, narrowly oblong-lanceolate, acute or acuminate, slightly narrowed to the cordate slightly unequal base; upper surface shining; lower dull, pale, purplish when dry; lateral nerves 20 to 28 pairs, prominent beneath, spreading; length 10 to 20 in., breadth 1·75 to 4·5 in.; petiole stout, rusty-tomentose when young, ultimately glabrous, ·4 in. long. *Male flowers* in 6 to 8-flowered umbels, rising from short woody tubercles in the axils of leaves or of fallen leaves; pedicels ·3 to ·4 in. long, flocculent rusty-tomentose, as is the outer surface of the flower, the bracteole about the middle of the pedicel which is thinner above than below its insertion; buds obtusely 3-cornered, flat-topped, ·15 in. in diam.; *perianth* deeply divided into 3 blunt, triangular teeth, glabrous and striate inside. *Staminal disc* rotund, obscurely 3-angled, concave, glabrous; anthers about 12, radiating, curving upwards, sub-sessile; stalk of disc glabrous, cylindric, thickened upwards, prominently ridged. *Female flowers* ·3 in. long, in umbels like those of the male, but fewer-flowered, sessile, and the bracteole at the base of the perianth; bud ovoid-globose; segments of *perianth* ovate, sub-acute; *ovary* sessile, globose, densely rufous-tomentose; stigma sessile, discoid, with many linear lobes, glabrous. *Fruit* sub-globose at first and densely tomentose; when ripe ovoid or ellipsoid, blunt, 1 to 1·25 in. long, the perianth sub-accrescent and persistent at its base, rufous-tomentose; pericarp thick; arillus thin, completely enveloping the whole of the seed, except the extreme apex, where it is divided into 5 or 6 narrow lobes. *Hook. fil. Fl. Br. Ind.* v. 112; *A. DC. in Prod.* xiv. 1, 206; *Miq. Fl. Ind. Bat.* i. *pt.* 2, 70. Knema glaucescens, *Wall. Cat.* 6810 (*not of Jack*).

Penang, *Curtis* No. 1459. Perak, *King's Collector*. Malacca; *Griffith* No. 4346 (*Kew Distrib.*), *Maingay* (*Kew Distrib.* Nos. 1287 & 1288).

Resembling *M. intermedia* in many points, but with larger, cordate leaves, and a concave, not mammillate, glabrous staminal disc.

VAR. major, *King*. Fruit narrowly ovoid, pointed; the perianth not sub-accrescent or persistent, rufous-tomentose at first, partially glabrous when ripe, 1·5 to 2·5 in. long.

Perak; *King's Collector* Nos. 5600, 5720, 6059, 7551, 10349. Penang; *Curtis* Nos. 1459, 2456.

The leaves of this variety are usually rather larger than those of the typical form, and the fruit is always much larger. It might be better to treat this variety as a distinct species, for the perianth of the female is neither sub-accrescent nor persistent at the base of the fruit.

PLATE 155. Myristica furfuracea, *Hook. fil. & Thoms.* 1, Branch with male flowers; 2, twig with female flowers; 3, cluster of ripe fruit; 4, seed covered by arillus; 5, seed with arillus removed; 6, ripe fruit of VAR. *major—of natural size;* 7, male flower; 8, androecium; 9, female flower; 10, ovary—*enlarged.*

52. MYRISTICA LAURINA, *Blume Rumph.* i. 189, *t.* 61. A tree 40 to 60 feet high; young branches rather stout, pale brown, faintly striate; the youngest harshly rufous-tomentose. *Leaves* oblong to oblong-lanceolate or oblanceolate, shortly acuminate or acute, slightly narrowed to the rounded or minutely cordate slightly unequal base; upper surface shining, glabrous; lower covered, especially on the nerves, with minute, stellate, loose, rusty hairs; main nerves 12 to 18 pairs, spreading; length 4 to 9 in., breadth 1·5 to 2·5 in.; petiole ·25 to ·35 in., rufous-tomentose. *Male flowers* in dense, axillary, many-flowered umbels; pedicels ·2 in. long, the bracteole above the middle or sub-sessile; buds ·1 in. in diam., ovoid or slightly obovoid, densely shaggy, rufous-tomentose; teeth of *perianth* ovate, concave, glabrous and striate inside; *staminal disc* small, glabrous, concave, bearing 7 to 9 erect, sessile, extrorse anthers; stalk glabrous, cylindric, thickened towards the apex, striate. *Female flowers* like the male, but always sessile, and the rachis woody and elongating; *ovary* sessile, depressed-globose, densely rufous-tomentose; style 0 or very short; stigma as long as the ovary with 2 deep, obovate, laterally compressed, sub-lobulate lobes. *Fruit* ·75 to 1 in., rarely 1·25 in. long when ripe; ovoid or ellipsoid, often obovoid, blunt, sub-sessile or shortly pedicellate, densely covered with coarse rufous tomentum; arillus thin, red, entire, completely enveloping the ellipsoid seed. *A. DC. in Prod.* xiv. 1, 206; *Miq. Fl. Ind. Bat.* i. *pt.* 2, 70; *Ann. Mus. Lugd. Bat.* ii. 51; *Hook. fil. Fl. Br. Ind.* v. 112 (*in part*). M. tomentosa, *Blume* (*not of Thunbg.*) *Bijdr.* 577.

Malacca; *Griffith, Ridley.* Singapore; *Ridley, King.* Perak; *Scortechini, King's Collector,* Distrib.—Java (*Zoll. Cat.* 996), Sumatra.

The best marks of this species are the small staminal disc with only 6 to 8 stamens which are erect or sub-erect, not horizontal; the loose, stellate hairs of its young parts and of the under surfaces of the leaves. Blume's otherwise excellent figure shows the fruit in only a young state, and the leaves have attenuate bases, much the more common form of leaf-base being rounded and cordate.

PLATE 156. Myristica laurina, *Blume.* 1, Branch with male flowers; 2, part of branch which has borne female flowers; 3, branch with nearly ripe fruit; 4, a ripe fruit; 5, vertical section through young fruit to show seed; 6, seed covered by its arillus—*of natural size;* 7, male flower open and seen from above; 8, the same unopened with its bracteole; 9, androecium; 10, female flower; 11, ovary, style, and stigma—*enlarged.*

53. Myristica glauca, *Blume Bijdr.* 576; *Rumphia*, i. 182, *t.* 60. A tree from 25 to 70 feet high; branches when quite young rusty-puberulous; afterwards glabrous, dark-coloured. *Leaves* thinly coriaceous, glabrous when adult, oblong-lanceolate, slightly narrowed to the acute or shortly acuminate apex and to the cuneate or rounded base; upper surface glabrous, shining; lower whitish or pale brown, but not glaucous, the nerves darker; main nerves 14 to 20 pairs, spreading; length 5 to 10 in., breadth 1·6 to 2·5 in.; petiole ·4 to ·6 in. *Male flowers* in umbels of 3 to 6, from short axillary tubercles; the pedicels ·25 to ·35 in. long, with a minute semi-rotund bracteole close to the flower; buds ovoid-globose, ·2 in. in diam.; *perianth* lobes ovate, rather blunt, ferruginous-tomentose outside like the pedicels; glabrous and striate within. *Staminal disc* glabrous, concave; the anthers 6 to 12, sessile, sub-erect; pedicel of disc long, a little thickened upwards, ridged, glabrous. *Female flowers* umbellate like the males, but the pedicels shorter and the buds oblong, ·2 in. wide when expanded; the teeth sub-acute, triangular, concave, tomentose externally like the males; inside the teeth glabrous; the tube tightly embracing the pistil. *Ovary* globular, densely rufous-tomentose; style short, fleshy; stigma broad, fleshy, 2-lobed, the lobes lobulate. *Fruit* shortly stalked, solitary or 2 to 5 together, ellipsoid to ovoid globose, rather pointed, densely rufous-tomentose at first, ultimately glabrous; ·75 to 1·25 in. long, slightly ridged at the suture; arillus fleshy, quite entire, and enveloping the whole of the broadly ovoid seed. M. Sumatrana, *Bl. Rumph.* i. 187; M. corticosa, *Hook. fil. & Thoms. Fl. Ind.* 158 (*in part*); *A. DC. Prod.* xiv. 1, 205 (*in part*); *Miq. Fl. Ind. Bat.* i, *pt.* 2, 69, *and in Ann. Mus. Lugd. Bat.* i. 207; ii. 51 (*both in part*); *Kurz Fl. Burm.* ii. 284 (*in part*). M. glaucescens, *H. f. Fl. Br. Ind.* v. 111, *vix H. f. & Th.* (*in part*). Knema corticosa, *Lour. Fl. Coch.-Chine, ed. Willd.*, 742.

Tenasserim; *Gallatly*. Martaban and Pegu, *Kurz*. Diamond Island and Narcondam, *D. Prain*. Andamans; *Kurz, King*. Nicobars; *Kurz, King's Collector*. Penang; *Curtis*. Singapore; *Ridley, Cantley*. Malacca; *Maingay* (*Kew. Dist.*) 1280-2, *Hervey*. Distrib.—Sumatra, Java.

The Burmese and Andamans' specimens, upon which the foregoing description is founded, agree well with Blume's description and figure of *M. glauca*, and are exactly like authentic specimens of *M. glauca* at Peradeniya, Calcutta and Leiden; and also (*fide Hook. fil. & Thoms. Fl. Ind.* 158) with authentic specimens of Loureiro's *Knema corticosa*. Drs. Hooker and Thomson, being at the time they wrote the *Flora Indica* of the opinion that the genus *Knema* would ultimately have to be kept up, gave this species the name *Myristica corticosa*. In the subsequently published *Flora of British India*, however, Sir Joseph Hooker writes that "the copious specimens received since the date of the *Flora Indica* show that the Tenasserim and Malayan plants included under *M. corticosa* in that work are not different from *M. glaucescens*." The very numerous specimens brought still more recently by the Calcutta Garden Collectors from Perak, the Andaman Islands and elsewhere, seem to me to prove that Sir Joseph Hooker's earlier view is the correct one, and that *Knema corticosa* and *Myristica glaucescens* are separable by the characters given above. I have therefore followed the earlier view.

In his *Rumphia* (i. 187) Blume proposes the name *M. Sumatrana* for a plant collected by Korthals in Sumatra and referred by that botanist to *M. glauca*, Bl. This plant appears to be merely a large-leaved form of *M. glauca*, and is the plant named by Miquel (*Fl. Ind. Bat. Suppl.* 384) *M. corticosa*, H. f. & T., var. *Sumatrana*. *M. glauca*, Bl., var. *Sumatrana*, Miq., is also apparently (as specimens from the Leiden

Herbarium show) his own *M. corticosa*, Bl., VAR. *lanceolata*. In Blume's figure of *M. glauca* (*Rumphia* i. *t.* 60) the arillus is represented as red; whereas in specimens from Narcondam, of which the fruit was not quite ripe when collected by Dr. Prain, the arillus was pearly white. Possibly the red colour develops as the fruit ripens ? Should *Knema* be re-established as a genus, the name of this plant would therefore be *Knema corticosa*, Lour. (1793). But as a *Myristica*, the name *M. glauca*, Blume (1825), takes precedence.

PLATE 157. Myristica glauca, *Blume*. 1, Branch with ripe fruit (original specimen from Buitenzorg Herbm.); 2, portion of branch with male flowers; 3, portion of branch with female flowers; 4, cluster of young fruit; 5, arillus covering seed—*all of natural size;* 6, male flower; 7 & 8, staminal column and disc with anthers; 9, female flower; 10, ovary—*enlarged.*

54. MYRISTICA MISSIONIS, *Wall. Cat.* 6788. A tree 20 to 50 feet high; young branches slender, dark-brown, minutely tawny-pubescent when young, ultimately glabrous and striate. *Leaves* linear-lanceolate to oblong-lanceolate, rarely oblanceolate, acute or shortly acuminate, the base acute; both surfaces glabrous, the upper shining, the lower rather pale, sub-glaucous, the midrib prominent; main nerves 12 to 14 pairs, sub-erect, slightly prominent beneath, puberulous when young; length 3·5 to 6·5 in., breadth 1 to 1·5 in. (rarely 1·75 in.); petiole ·4 to ·5 in. *Male flowers* in numerous, 6 to 9-flowered fascicles on short axillary, warted tubercles; buds depressed-globose, bluntly 3-angled, ·1 in. in diam.; *perianth* thick, with 3 triangular teeth, stellate-tomentose outside, striate and glabrous inside; pedicel ·2 to ·3 in. long, tomentose like the perianth; the bracteole above the middle, small. *Staminal disc* concave, its stalk short, striate; anthers about 11, sessile, radiating. *Female flowers* larger than the males, but in fewer-flowered racemes; buds clavate; *perianth* with 3 broad, obtuse, spreading teeth; *ovary* globose, rufous-silky; style short, glabrous; stigma with 2 spreading, lobulate lobes. *Fruit* spherical, apiculate, ·5 to ·6 in. in diam., silky-tomentose at first, but glabrescent with age, the slightly enlarged perianth persistent at its base; *seed* globose, smooth; arillus thin, fimbriate at the apex. M. corticosa, *Hook. fil. & Thoms. Fl. Ind.* 158 (*in part*); *A. DC. in Prod.* xiv. 1, 205; *Miq. Fl. Ind. Bat.* i. *pt.* 2, *p.* 69 (*in part*); *Kurz For. Fl. Burm.* ii. 284. M. glaucescens, *Hook. fil. Fl. Br. Ind.* v. 859. M. sphærula, *Hook. fil. Fl. Br. Ind.* v. 111 (*in part*). M. lanceolata, *Wall. Cat.* 6794. ? M. angustifolia, *Roxb. Fl. Ind.* iii. 847.

Burmah: at Mergui, *Griffith;* at Yaitho, *Brandis;* at Rangoon, *Falconer; Helfer*, (*Kew Distrib.* No. 4344). Penang, *Curtis* Nos. 700 & 935. Malacca; *Griffith, Harvey, Cantley.* Selangor, *Curtis.* Pahang, *Ridley* No. 541.

The descriptions of their species given by the earlier writers on *Myristica* are so incomplete, that it is very doubtful whether several of the synonyms reduced above ought really to fall here.

PLATE 158. Myristica Missionis, *Wall.* 1, Branch with male flowers; 2, branch with female flowers; 3, twig with ripe fruit—*of natural size;* 4, male perianth; 5, androecium; 6 & 7, female flowers; 8, ovary, style, and stigma—*enlarged;* 9 style and stigma—*still further enlarged.*

55. MYRISTICA GIBBOSA, *Hook. fil. & Thoms. Fl. Ind.* 158. A tree; the youngest branches slender, at first rufous scurfy-puberulous, their bark afterwards dark-coloured,

but with a pale glaucous bloom. *Leaves* thinly coriaceous, oblong-lanceolate or oblong-oblanceolate, acute or sub-acute; base cuneate, slightly oblique, rarely rounded; upper surface shining; the lower pale, glaucous or sub-glaucous, the 15 to 20 pairs of nerves spreading, prominent beneath; length 3·5 to 7 in., breadth 1 to 2·5 in.; petiole ·4 to ·6 in. *Male flowers* in axillary umbels on woody peduncles which become warted and lengthen with age to about ·5 in.; *flowers* on short pedicels, rarely so much as ·25 in. long, rufous-tomentose, the bracteole sub-rotund, close to the base of the flower; buds sub-globose; *perianth* about ·15 in. in diam., deeply divided into 3 broad, triangular teeth; outside hairy like the peduncles, inside ridged and glabrous; staminal disc flat or sub-concave, glabrous, with about 10 sessile anthers radiating from its edge, its stalk thick, shorter or longer than the perianth-tube. *Female flowers* in axillary pedunculate umbels like the males; flower oblong, blunt, not obovoid; *perianth* as regards hairs like the male, its teeth shorter; *ovary* sessile, broadly ovoid, pointed, rufous-hairy; style short, fleshy; stigma with 2 large, fleshy, flat, obliquely pointed lobes. *Fruit* 1 in. long and ·75 in. in diam., obliquely ovoid, pointed, gibbous at one side, 2-ridged, minutely rufous-tomentose, pedicel ·3 to ·4 in.; arillus thin, enveloping the whole seed, with 4 to 6 shallow lobes at the apex; *seed* ovoid, smooth. *Hook. fil. Fl. Br. Ind.* v. 112; *A. DC. in Prod.* xiv. 1, 205. M. corticosa (in part), *Kurz For. Fl. Burm.* ii. 284.

Assam; *Griffith*, *Jenkins*, *Masters* No. 1952; *Collett* No. 70. Khasia, *Hook. fil. & Thoms.*; *Griffith* (*Kew Dist.*) No. 4348. Chittagong, *Hook. fil. & Th.* Burmah; *Scott*, *Kurz* No. 983; *Helfer* No. 4349, *Griffith*. Malacca; *Maingay* (*Kew Dist.* No. 1282); *Miller*.

This does not seem to be a common species. The best two marks by which to distinguish it from its nearest ally *M. glaucescens*, Hook. fil. & Thoms., are the long, woody, warted, accrescent peduncles of its inflorescence, and the larger (1 to 1·25 in. long) gibbous fruit.

Plate 159. Myristica gibbosa, *Hook. fil. & Thoms.* 1, Branch with male flowers; 2, ripe fruit, entire; 3, vertical section of the same; 4, seed with arillus—*of natural size*; 5 & 6, male flowers; 7 & 8, staminal column and disc with anthers; 9, female flower; 10, ovary—*enlarged*.

56. Myristica geminata, *Miq. Fl. Ind. Bat. Supp.* 385. A tree; young branches slender, rufous-furfuraceous (as are the leaves), ultimately glabrous. *Leaves* thinly coriaceous, oblong-lanceolate, sub-acuminate, the base cuneate or rounded; upper surface shining, the lower sub-glaucous; main nerves 12 to 15 pairs, thin but prominent beneath, spreading; length 3 to 4 in., breadth 1 to 1·3 in.; petiole ·3 to ·5 in., thin. *Male flowers* in 3 or 4-flowered, sessile, axillary umbels; pedicel ·2 in. long, the bracteole small, just above its middle; buds globose and less than ·1 in. in diam. *Perianth* with 3 ovate, sub-acute teeth, externally rufous-puberulous, internally glabrous and striate; *staminal disc* flat, glabrous, with 9 or 10 sessile anthers radiating from its edge and curving upwards; stalk of disc short, glabrous. *Female flowers* unknown. *Fruit* axillary, usually in pairs, often solitary, ellipsoid or ovoid, not gibbous, the apex blunt, the base narrowed, the sides ridged, minutely rufous-pubescent, ·75 to 1 in. long; pericarp thin; arillus thin, fleshy, entire, below the apex slightly laciniate; *seed* shining.

Burmah, Tenasserim; *Bot. Gard. Collector*. Perak, *Scortechini* No. 1527. Distrib.—Sumatra.

This species was originally described by Miquel from Sumatran specimens. It is allied to *M. gibbosa*, H. f. & Th., from which it differs chiefly in its sessile, not elongated and warted, male inflorescence; in its much smaller flowers with bracteole not close to the bud; and in its fruit, not gibbous and not pointed. It is also allied to *M. glaucescens*, H. f. & Th.

Plate 160. Myristica geminata, *Miq.* 1, Branch with male flowers; 2, fruiting branch; 3, fruit in section; 4, seed covered by arillus; 5, apex of arillus—*of natural size;* 6, male flower; 7, androecium—*enlarged.*

57. Myristica glaucescens, *Hook. fil. & Thoms. Fl. Ind.* 157. A tree 30 to 50 feet high; youngest branches minutely rufous-pubescent; ultimately glabrous, dark-coloured and striate, slender. *Leaves* membranous, oblong-lanceolate to narrowly elliptic, sub-acute, base rounded or slightly cuneate; upper surface glabrous, shining; lower always pale, sub-glaucous; lateral nerves 13 to 16 pairs, spreading, rather prominent beneath; length 4 to 6 in., breadth 1·25 to 2 in.; petiole ·35 in. *Male flowers* in almost sessile, axillary, 5 to 8-flowered umbels on long (·5 to ·6 in.) puberulous pedicels, minutely bracteolate above the middle; buds depressed-globose, bluntly 3 angled; *perianth* deeply divided into 3 broadly ovate, acute or sub-acute, fleshy teeth, outside minutely scurfy-tomentose, inside longitudinally striate, glabrous; *staminal disc* on a short stalk, thickened upwards, flat or sub-concave, glabrous or pubescent; stamens 9 to 11, sub-sessile, broadly ovate, radiating from the edges of the disc. *Female flowers* in fewer-flowered umbels than the males, obovoid in bud; *ovary* sessile, ovoid-globose, narrowed at the apex; style very short; stigma peltate, with 4 acute lobes, glabrous. *Fruit* small, ovoid or slightly obovoid, narrowed at the base, ·5 to ·65 in. long, minutely rusty-tomentose, the stigma persistent; pedicel ·25 in. long; arillus thin, uniform, irregularly fimbriate at the apex, enveloping the whole of the ovoid-rotund, smooth, dark-coloured seed. *Hook. fil. Fl. Br. Ind.* v. (*in part*). M. corticosa, *A. DC. in Prod.* xiv. 1, 205 (*in part*); *Miq. Fl. Ind. Bat.* i. *pt.* 2, *p.* 69 (*in part*). ? Knema glaucescens, *Jack in Mal. Misc.* No. VII, 35, *& Hook. Comp. Bot. Mag.* i. 148 (*not of Wall.*)

Malacca; *Griffith* (*Kew Distrib.*) No. 4343; *Maingay* (*Kew Distrib.*) Nos. 1280 & 1299; *Cantley.* Perak; *King's Collector*, *Wray.* Singapore, *Ridley.*

This is well marked by its small fruit, the seed and aril of which have an odour more like that of black pepper than of nutmeg. *M. intermedia*, var. *minor*, Miq. (*Fl. Ind. Bat.* i. 70), may probably belong to this, as is suggested by Sir Joseph Hooker. And, judging from Miquel's description, his *M. palembanica* (*Fl. Ind. Bat Suppl., pp.* 384 & 385) differs but slightly from this.

Plate 161. Myristica glaucescens, *Hook. fil. & Thoms.* 1, Branch with ripe fruit; 2, ripe fruit in section showing seed and arillus; 3, seed and arillus seen from above; 4, fascicle of male flowers—*of natural size;* 5, androecium; 6, female flower; 7, ovary—*enlarged.*

58. Myristica erratica, *Hook. fil. & Thoms. Fl. Ind.* 156. A tree 20 to 30 feet high; young branches slender, at first rusty, scurfy, sub-stellately deciduously tomentose; ultimately glabrous, striate and rather pale. *Leaves* thinly coriaceous, narrowly oblong-lanceolate, rather suddenly narrowed to the acute apex; the base rounded or cuneate, never cordate; upper surface glabrous, shining; the lower dull, sub-glaucous, glabrous except the persistently minutely tomentose midrib; main nerves 20 to 25 pairs,

prominent beneath, spreading; length ·6 to 1 in., breadth 1·5 to 2·5 in.; petioles ·25 to ·5 in., slender. *Male flowers* on short, slender, 8 to 12-flowered axillary tubercles, depressed-obovoid, not angled, ·1 in. in diam., the pedicels from ·2 to ·3 in. long, bracteole minute; *perianth* divided half-way down into 3 broad, triangular, concave, fleshy teeth, minutely cinereous-tomentose outside, as are the pedicels, glabrous and striate internally; stalk of *staminal disc* very short, the disc itself triangular, almost flat; anthers about 16 or 18 with short filaments, dehiscing downwards. *Female flowers* unknown. *Fruit* axillary, solitary or in pairs, rarely in clusters of 3, pedicellate, ellipsoid, ·5 to ·6 in. long, when young densely and coarsely stellate rufous-tomentose, when old scantily tomentose; pedicel very slender, ·3 to ·4 in. long; pericarp thinly coriaceous; arillus thin, uniform, completely enveloping the seed, laciniate at the very apex; *seed* ovoid, smooth. *A. DC. in Prod.* xiv. 1, 205. M. longifolia, *Wall.*, VAR. erratica, *Hook. fil. Fl. Br. Ind.* v. 110. M. corticosa, *Hook. fil. & Thoms. Fl. Ind.* 156 (*in part*). ? M. linifolia, *Roxb. Fl. Ind.* iii. 847.

This is closely allied to *M. longifolia*, Wall. It is, however, smaller than that species in all its parts, the leaves alone excepted, and these are sometimes as large as in the smaller forms of *M. longifolia*. Their bases, however, in this are either cuneate or rounded; they are never cordate. The fruits of this are on thin pedicels; they are never sessile, and they are much smaller than those of *longifolia*, being, even when quite ripe, never more than ·5 to ·6 in. in length. Moreover, the anthers of this have short filaments, whereas those of *M. longifolia* are sessile, and the stalk of the staminal disc is in this much shorter.

Sikkim: at 3,000 to 5,000 feet, *King*. Assam; *Griffith, Kew Distrib.* No. 4347. Khasia, *G. Mann*. Cachar, Daleswari Forest, *G. Mann*.

PLATE 162. Myristica erratica, *Hook. fil. & Thoms.* 1, Branch with male flowers; 2, branch with fruit; 3, section of fruit—*of natural size;* 4, male flower; 5, androecium seen from the side; 6, the same seen from above—*enlarged*.

59. MYRISTICA LONGIFOLIA, *Wall. Cat.* 6801. A tree from 30 to 60 feet high; young branches slender, the youngest parts at first covered with rusty, scurfy, sub-stellate, deciduous tomentum; afterwards glabrous, striate and rather pale *Leaves* coriaceous, from linear-oblong to oblanceolate or elliptic-oblong, conspicuously narrowed to both ends; the apex acute or sub-acute; the base slightly cordate or emarginate, or rounded, sometimes slightly unequal; both surfaces glabrous, the lower sub-glaucous; main nerves 25 to 35 pairs, prominent, spreading; length 10 to 18 in., breadth 3 to 5 in.; petiole ·5 to ·75 in., stout, deciduously tomentose like the young branches. *Male flowers* on short, 4 to 6-flowered, axillary tubercles, pyriform or depressed-obovoid, bluntly 3-angled, about ·25 in. in diam.; the pedicels from ·25 to ·5 in. long, with a single minute bract; *perianth* divided about half-way down into 3 broad, triangular, fleshy, concave teeth, rusty stellate-tomentose outside, as are the pedicels, glabrous and striate inside; stalk of *staminal disc* long, cylindric, slightly thickened above, the disc itself orbicular, obscurely 3-angled, sub-concave, bearing on its edge about 14 to 18 sessile, sub-horizontal, 2-celled, extrorse anthers. *Female flowers* unknown. *Fruit* axillary, solitary or in clusters of 2 to 3, sessile, ellipsoid or ovoid, 1 to 1·5 in. long, blunt, densely covered with coarse, short, stellate, rufous tomentum; never glabrous; arillus thin, uniform, laciniate near the apex, completely enveloping the smooth ovoid seed. M. longifolia, *A. DC. in Prod.* xiv. 1, 204.

M. longifolia (in part), *Hook. fil. & Thoms. Flor. Br. Ind.* 156; *Kurz For. Flor. Burm.* ii. 283; *Miq. Fl. Ind. Bat.* i, *pt.* 2, *p.* 69.

Hot valleys in the Eastern Himalaya, and in the Assam and Chittagong Hill Ranges; Naga and Khasia Hills; Burmah.

There are in the Calcutta Herbarium imperfect specimens from Assam of what may be a new species of *Myristica*, closely allied to *longifolia*. One of these (No. 4345, *Herb. Griffith*, and attributed to Burmah) has leaves often 2 feet long with cuneate bases and with sub-sessile male flowers.

Plate 164. Myristica longifolia, *Wall.* 1, Branch with male flowers; 2, male flower; 3, the same dissected—*of natural size;* 4 & 5, androecium—*enlarged.*

Plate 166. Myristica longifolia, *Wall.* 1, Branch with ripe fruit; 2, fascicle of ripe fruit; 3, ripe fruit in section showing seed; 4, seed covered by arillus—*all of natural size.*

60. Myristica Clarkeana, *n. sp. King.* A tree 60 to 80 feet high; youngest branches densely furfuraceous, rusty-tomentose, soon becoming glabrous and dark-coloured, the older cinereous. *Leaves* coriaceous, glabrous except the petioles, oblong to elliptic oblong, sometimes oblanceolate, sub-acuminate, slightly narrowed in the lower third to the rounded, emarginate or slightly cordate base; upper surface shining, the lower dull, sub-glaucous; main nerves 18 to 25 pairs, spreading, rather prominent, some of them bifurcating; length 10 to 17 in., breadth 1·75 to 4 in.; petiole ·4 to ·7 in., rusty-tomentose at first, afterwards glabrous. *Male flowers* in crowded clusters of from 8 to 16 from tubercles in the axils of leaves or of fallen leaves; pedicellate, clavate, ·25 in. long, covered like the pedicels with dense, soft, rufous tomentum; pedicels ·25 to ·35 in. long, the bracteole minute and near the base; *perianth* coriaceous, divided into 3 rather short broad, deep, triangular, concave teeth, vertically striate internally; stalk of *staminal disc* as long as the tube of the perianth, cylindric, slightly thickened upwards, striate, glabrous; the disc orbicular, concave, glabrous; anthers about 13, ovate, rather short, at first erect, ultimately horizontal, dehiscing downwards. *Female flowers* unknown. *Fruit* narrowly ellipsoid, pointed at both ends, rather under 1·5 in. long and about ·75 in. in diam., at first rufous-tomentose, ultimately quite glabrous; pericarp thin, coriaceous; arillus thin, entire, covering the whole of the seed, slightly laciniate and conduplicate at the apex; *seed* ellipsoid, smooth.

Chittagong: *Collectors of Botanic Garden, Calcutta*, Nos. 97, 412, 496 & 605. Assam, *Peal* No. 90.

A species allied to *M. longifolia*, Wall., but with leaves less glaucous beneath; more clavate, more numerous male flowers; and with glabrous, narrowly ellipsoid fruit, pointed at both ends.

Plate 165. Myristica Clarkeana, *King.* 1, Branch with male flowers; 2, ripe fruit; 3, arillus covering seed; 4, pericarp opened up—*of natural size;* 5, male flower; 6, staminal column and disc with anthers—*enlarged.*

61. Myristica Hookeriana, *Wall. Cat.* 6802*A*. A tree 50 to 80 feet high; young branches stout, the youngest parts (as well as the pedicels, flowers, and ripe fruit) densely covered with tawny or rufous, soft, flocculent wool. *Leaves* coriaceous, oblong-lanceolate or oblong-oblanceolate, apex obtuse or acute, edges wavy, narrowed to the sub-acute, sometimes minutely cordate, base; both surfaces glabrous when adult, but occasionally

with irregular scattered tufts of flocculent wool; upper shining, lower sub-glaucous; lateral nerves 20 to 30 pairs, prominent below, spreading; length 1 to 2 feet, breadth 2·5 to 7 in.; petiole stout, ·5 in. long. *Male flowers* in clusters of 6 to 9 from tubercles in the axils of fallen leaves, ·35 in. in diam.; pedicels ·75 to 1·25 in., the bracteole above the middle, adpressed. *Perianth* obovoid, the teeth 3, broadly triangular, fleshy, glabrous inside and longitudinally rugose towards the base. Stalk of *staminal disc* short, glabrous, striate, thickened upwards so as to pass gradually into the triangular, sub-concave, glabrous disc. Anthers about 20, sessile, spreading, narrowly ovate. *Female flowers* like the males, but with shorter pedicels and broader teeth; *ovary* densely woolly; stigma sub-sessile, concave, with many irregular narrow lobes. *Fruit* ellipsoid, 2 to 3 in. long, covered with a coating one-fourth of an inch thick of dense, silky, fulvous wool; pericarp crustaceous, ·25 in. thick; arillus thin, uniform, scarlet, completely enveloping the cylindric-ovoid seed. *Hook. fil. & Thoms. Fl. Ind.* v. 156; *Hook. fil. Fl. Br. Ind.* 109; *Miq. Fl. Ind. Bat.* i. *pt.* 2, *p.* 69; *A. DC. in Prod.* xiv. 204.

Penang, Perak, Malacca and Singapore; not uncommon.

Plate 163. Myristica Hookeriana, *Wall.* 1, Leaf-twig; 2, cluster of male flowers; 3, ripe fruit; 4, transverse section of same; 5, male flowers—*of natural size;* 6, staminal disc and anthers seen from above—*enlarged;* 7, fascicle of female flowers; 8, ovary; 9, the same dissected—*of natural size;* 10, stigma—*enlarged.*

62. Myristica Curtisii, *n. sp. King.* A tree; all parts glabrous, except the minutely puberulous leaf-buds and male flowers; young branches slender, rather dark, black. *Leaves* thinly coriaceous, narrowly elliptic-oblong or elliptic-lanceolate to elliptic-obovate, the apex acute or sub-acute, the base acute; when dry the edge slightly recurved; upper surface pale-greenish when dry, shining; lower dull, whitish, sub-glaucous; main nerves 9 to 16 pairs, faint, spreading, evanescent towards the margin; length 3 to 3·5 in., breadth 1 to 1·6 in.; petiole ·4 in. *Male flowers* in umbels of 3 to 10, from short, woody, axillary tubercles; pedicels ·35 to ·4 in. long; bracteole near the middle of the pedicel very small, minutely puberulous, as is the outside of the perianth; buds depressed-obovoid, ·15 in. in diam.; teeth of *perianth* fleshy, concave, broadly triangular. *Staminal disc* large, very concave, in some stages with a convexity in the middle, obtusely 3-cornered, striate beneath, suddenly contracted into the short stalk; edge of disc quite entire, bearing on its lower surface 40 to 45 small ovate anthers. *Female flowers* in few-flowered umbels; perianth not seen; *ovary* sessile, ovoid, conical, tomentose; the stigma with 6 radiating, acute teeth. *Fruit* solitary or in pairs, elliptic-ovate, sub-gibbous, 1·35 in. long, ·75 in. in diam., keeled at the suture, rusty-puberulous, pedicel ·4 in. long; arillus completely covering the seed, thin, entire or slightly lobulate at the apex.

Penang; near the Waterfall, *Curtis* No. 1024, and at Penara Bukit (1,000 feet) 1301. Perak; near the Hermitage (elevation 3,000 feet), *Curtis* No. 1320; *Scortechini* No. 292; Thaiping, *Wray* No. 2112. Malacca, *Maingay* (*Kew Distrib.* No. 1301).

Of this species Sir J. D. Hooker had seen only Maingay's fruiting specimen (No. 1301) when he elaborated the genus *Myristica* for the *Flora of Brit. India.* But, in a note to p. 113 of the 5th volume of that work, he gave a partial description of it, and indicated it as a new species. Maingay in a MSS. note, of which Sir Joseph Hooker has most kindly sent me a copy, describes the ripe fruit as follows:—"Fruit

elliptic-ovoid, the bigger end towards the base, 1·5 by 1 in., suddenly attenuated into a thin stipes, minutely ferruginous-puberulous-pilose, at length sub-glabrous, pale greenish-orange. *Seed* elliptic, ·9 by ·6 in.; aril complete, fleshy, blood-red, slightly plicate-lobate at the apex; testa pale buff, membranous; tegment crustaceous." The androecium is remarkable for the number (45) of its anthers.

Plate 167. Myristica Curtisii, *King*. 1, Branch with male flowers (from Wray's Perak specimen No. 2112); 2, branch with young fruit (from Curtis's Perak specimen No. 1320); 3, ripe fruit from Maingay's specimen No. 1301; 4, seed covered by its arillus—*of natural size;* 5, bud of male flower; 6, male flower opened; 7, the same dismembered; 8, staminal disc with anthers; 9, ovary—*enlarged.*

63. Myristica Cantleyi, *Hook. fil. Fl. Br. Ind.* i. 110. A tree 20 to 50 feet high; young branchlets slender, densely felted with rufous tomentum, afterwards glabrous and pale brown, rarely dark-coloured. *Leaves* coriaceous, oblong or linear-oblong, acute, the base rounded or sub-acute; when very young flocculent rufous-tomentose, ultimately quite glabrous on both surfaces; main nerves 16 to 20 pairs, thin but prominent and forming intramarginal arches; midrib prominent on both surfaces; length 9 to 15 in., breadth 2 to 3 in.; petiole about 1 in., at first rufous-tomentose, like the branchlets, but ultimately glabrous. *Male flowers* densely felted, rufous-tomentose, in many-flowered sessile umbels from the axils of leaves and of fallen leaves; pedicels ·25 to ·4 in. long, tomentose like the perianth, bracteole close to the flower; buds depressed, obovoid-globose, ·25 in. in diam.; lobes of the *perianth* broadly triangular, glabrous within; *staminal disc* orbicular, very convex (mammillate), papillose; anthers 13 to 15, on short filaments radiating from its edges and dehiscing downwards. Stalk of disc very short, thick, minutely hairy, not ridged. *Female flowers* sessile, in few-flowered clusters; buds ovoid, the bracteole minute, close to the flower; lobes of *perianth* triangular, glabrous inside; *ovary* globular, ovoid, sessile, densely rufous-tomentose; style short; stigma large, stellate, with about 12 deep narrow lobes. *Fruit* ellipsoid, blunt, about 1·25 in. long, ·8 in. broad, densely covered with felted rufous tomentum; the three lobes of the perianth slightly enlarged and persistent at its base; peduncle thick, ·25 in. long; arillus thin, entirely enclosing the narrowly obovate, pointed seed.

Singapore, *Cantley*. Perak: at low elevations common; *King's Collector*, *Wray*.

Allied to *M. intermedia*, Bl., by its umbonate disc, and not unlike it in leaf and fruit, but much more tomentose. At once distinguished by the persistent perianth at the base of the fruit.

Plate 168. Myristica Cantleyi, *Hook. fil.* 1, Branch with male flowers; 2, ripe fruit; 3, seed covered by its arillus—*of natural size;* 4, male flower; 5 & 6, staminal column and disc with anthers; 7, ovary; 8, stigma seen from above—*enlarged.*

Imperfectly known species, of which the position is uncertain.

64. Myristica exaltata, *Wall. Cat.* 6804 *A. & B.* A tree; young branches dark-coloured, smooth. *Leaves* thinly coriaceous, oblong to oblong-lanceolate, acute; the base slightly cuneate or rounded, both surfaces glabrous, the upper shining, the

lower paler and duller; main nerves 16 to 18 pairs, spreading, rather straight, interarching indistinctly close to the margin, thin but prominent on the lower surface; length 10 to 12 in., breadth 3 to 3·5 in.; petiole ·75 to 1 in. *Male* and *female flowers* unknown. *Fruit* in lax, glabrous panicles, about a foot long, ellipsoid, the apex blunt, suddenly constricted just above the base, 1·25 to 1·5 in. long; pericarp leathery, thin, glabrous; arillus thin, fleshy, shortly laciniate at the apex, covering the whole of the seed. M. amygdalina, VAR. Hookeri, *A. DC. in Prod.* xiv. 1, 204 (*in part*).

Burmah; Trogla Hills, Tavoy, *Wallich.*

This has not been collected since Wallich's time. It is very distinct from any other Burmese species; its nearest ally being the Penang species *M. racemosa*, King, and the Molucca and Celebes species *M. macrocoma*, Miq. Wallich's types of this were collected, according to his catalogue, only on the Trogla Hills and at Tavoy. The specimens from Moulmein, which he appears to have distributed under this name, belong to other species; and they have been referred by Sir Joseph Hooker and M. DeCandolle partly to *M. amygdalina*, Wall., VAR. *Hookeri*, and partly to *M. Irya*, Gærtn. *M. macrocoma*, Miq., has leaves thinner than this and more rufous beneath. It has fruit-racemes only half as long as the leaves, and the fruits themselves are smaller and tapering to each end.

PLATE 174. Myristica exaltata, *Wall.* 1, Leaf-twig; 2, panicle with ripe fruit; 3, fruit opened up; 4, seed covered by its arillus—*of natural size.* (*Drawn from Wall. Cat. No.* 6804 *from Trogla Hills.*)

65. MYRISTICA RACEMOSA, *n. sp. King.* A tree 40 to 50 feet high; youngest branches thin, glabrous, dark-coloured; the older striate, polished. *Leaves* thinly coriaceous, elliptic to elliptic-oblong, sub-acute or very shortly and abruptly acuminate, the base rounded or slightly cuneate; both surfaces glabrous, the upper shining, the lower dull and paler; main nerves about 12 pairs, slightly prominent on the upper, very prominent on the lower surface, thin, rather straight, spreading, interarching very faintly near the margin; length 6 to 8 in., breadth 2 to 3 in.; petiole ·5 to ·65 in. *Male* and *female flowers* unknown. *Fruit* in lax glabrous racemes, a foot or more in length, ovoid, slightly oblique, pointed, 1·75 in. long and about 1 in. in diam.; pericarp thickly leathery, glabrous; arillus fleshy, red, completely enveloping the seed, shortly fimbriate at the apex; *seed* smooth, ovoid, pointed.

Penang; *Curtis* No. 934.

Of this very distinct and fine species only a single tree is now known to exist in Penang, and it is a female. A second tree existed until last year, when it was ruthlessly cut down by a Chinaman interested in the growth of some miserable kitchin-stuff. In its long fruiting racemes this resembles *M. exaltata*, Wall. Cat. 6804.

PLATE 173. Myristica racemosa, *King.* 1, Leaf-twig; 2, raceme of ripe fruit; 3 & 4, ripe fruit dehiscing, with the valves separated to show the seed covered by its arillus; 5, ripe fruit undehisced; 6, seed with arillus partly removed—*all of natural size.*

66. MYRISTICA PALUDICOLA, *n. sp. King.* A tree 50 to 80 feet high; young branches about as thick as a goose quill, glabrous, lenticellate. *Leaves* coriaceous, oblong-lanceolate to elliptic-oblong, sub-acute, the edge recurved when dry, the base cuneate; upper surface (when dry) pale brown, dull, glabrous; lower cinnamoneous,

when young with some loose sub-flocculent pubescence, when adult minutely adpressed-puberulous; nerves 9 to 12 pairs, spreading, thin, interarching faintly towards the margin; length 5 to 8 in., breadth 2·25 to 3 in., petiole ·75 to 1 in. *Male flowers* unknown. *Female panicles* axillary, stout, branched, spreading, 2 to 3 in. long and about as broad, covered with deciduous, scurfy, rusty pubescence. *Flowers* ·1 in. in diam., depressed, obovoid-globose, glabrous; *perianth* thick, fleshy, 2-valved; *ovary* sessile, globose, ridged on one side, glabrous; stigma small, 2-lobed. *Fruit* 3 to 5, on short racemes or small panicles, narrowly ovoid, pointed, glabrous, the slightly accrescent perianth persistent at its base; pericarp coriaceous, thick (when dry rugose); arillus rather thick, fleshy, entire, enveloping the whole of the smooth seed.

Perak: in wet ground, at low elevations; *King's Collector* Nos. 4267, 4706, 6688; *Wray* No. 3071.

Plate 169. Myristica paludicola, *King*. 1, Branch with panicle of female flowers; 2, panicle of young fruit; 3, raceme of ripe fruit; 4, section of fruit; 5, arillus covering seed—*of natural size;* 6, female flower; 7, ovary—*enlarged*.

67. Myristica pendulina, *Hook. fil. in Fl. Br. Ind.* v. 859. A tree with spreading branches; the branchlets very long, as thick as the forefinger (at its base), slender towards the apex, finely rusty-tomentose when young, afterwards dark-coloured, glabrous and minutely warted. *Leaves* pendulous, coriaceous, narrowly oblong, acuminate; the base rounded or cuneate, narrowed into the very short, broad, winged petiole (the wings inflexed); upper surface pale brown, dull, glabrous; lower minutely rusty-tomentose at first, afterwards glabrous; nerves 30 to 50 pairs, spreading, rather prominent beneath, interarching boldly ·1 to ·2 in. from the margin; length 10 to 20 in., breadth 2 to 3 in.; petiole about ·25 in., broad, winged. *Male flowers* unknown. *Female* panicles ebracteate, axillary, robust, 3 to 4 in. long and about 2 in. broad, densely rufous-tomentose; branches short, horizontal, few-flowered. *Flowers* pedicellate, ellipsoid, ·25 in. long, glabrous; *perianth* coriaceous, shortly 2-fid; *ovary* broadly ovoid, sub-gibbous, grooved on one side, scurfy; stigma oblique, sessile. *Fruits* (unpollenised) one or two at the apex of a peduncle, ovoid, glabrous, about 2 in. long and 1·25 in. in diam; pericarp fleshy, ·4 or ·5 in. thick; peduncle 1·5 to 2 in. long.

Singapore; *Cantley, Ridley*. Distrib.—Bœræ.

Remarkable for the length of its leaves and short-winged petioles. This approaches *M. sylvestris*, Houtt. (with which it has indeed been mixed in the Royal Herbarium, Leiden), but has larger, smoother leaves and much thicker branches. The panicles of *M. sylvestris*, moreover, are pedunculate and have scurfy, rufous-tomentose bracts as long as the flowers. Only a single tree of this exists in Singapore, and it is a female. Every year it forms fruits, which of course are imperfect. It is of one of these which (through the kindness of Mr. Ridley, Director of the Botanic Garden, Singapore) I am enabled to give a figure. The tree, for a photograph of which I am also indebted to Mr. Ridley, presents a very remarkable appearance owing to its lax pendulous branches and long distichous leaves.

Plate 170. Myristica pendulina, *Hook. fil.* 1, Part of a branch with a panicle of female flowers; 2, an unfertilised fruit; 3, the same cut open—*of natural size;* 4, female flower; 5, ovary—*enlarged*.

68. Myristica retusa, *n. sp. King.* A tree 40 to 60 feet high; young branches stout, striate, pale brown or cinereous when dry, glabrous, except the very tips, which, like the leaf-buds and petioles of the young leaves, are cinereous-puberulous. *Leaves* very large, coriaceous, oblong or elliptic-oblong, often slightly obovate, the apex blunt and usually retuse, the edges a little recurved when dry, gradually narrowed from above the middle to the slightly cordate or rounded, sometimes unequal, base; upper surface glabrous, shining; lower pale brown or whitish from a uniform layer of dense minute hairs which persist everywhere except on the nerves; main nerves 16 to 24 pairs, spreading, sub-horizontal towards the base, prominent beneath and interarching close to the margin; length 13 to 21 in., breadth 5·5 to 8 in.; petiole ·5 to ·75 in., stout. *Male* and *female flowers* unknown. *Fruit* 2 to 3, in short woody racemes below the leaves, ovoid, gibbous at one side, shortly apiculate or beaked, deciduously and minutely rufous-tomentose; length (unripe) 2 to 2·25 in., diam. 2 in.; peduncle proper ·25 in. long, expanded into a ring at its apex; pericarp crustaceous, ·2 in. thick; arillus very short, embracing little more than the base of the seed, thin, much fimbriate; *seed* narrowly obovoid, smooth.

Perak: at elevations of 500 to 800 feet; *King's Collector* No. 7690.

A magnificent species, of which flowers of both sexes are unknown. It probably belongs to section *Pyrrhosa*.

Plate 171. Myristica retusa, *King.* 1, Branch with young fruit; 2, section of fruit showing seed with its small fimbriate arillus—*of natural size.*

Doubtful and excluded species.

M. angustifolia, *Roxb. Fl. Ind.* iii. 847, is probably *M. glauca*, Bl.

M. eugeniæfolia, *A. DC. Prod.* xiv. 1, 190. This is described from a specimen in leaf and fruit only, which is said to have been collected in Penang. I have not seen any specimen of it.

M. Finlaysoniana, *Wall. Cat.* 6793, is *Melodorum fulgens*, H. f. & T. (ex *Hook. fil. & Thoms. Fl. Ind.* 120).

M. glaucescens, *Wall. Cat.* 6790, is *Litsæa venulosa*, Meissn. A. DC. Prod. xv. 1, 187 [*sub Tetranthera*] (ex *Hook. fil. Fl. Br. Ind.* v. 161).

M. Heyneana, *Wall. Cat.* 6789, appears to be identical with Herb. Wight No. 2190 (Kew Distrib.) There is a specimen of each in the Calcutta Herbarium; that of the former has half of a fruit (detached); and the latter has detached male flowers. Dissection of the latter shows them to be those of a *Eumyristica*. The *perianth* is ovoid, inflated, glabrous on both surfaces, its teeth short and acute. The *andrœcium* is cylindric, shortly apiculate; the anthers are about 15, linear; and the stalk is equal to a quarter of the length of the column. The species may, I trust, be re-discovered.

M. Hookeri, *Wall. Cat.* 6802*B*, is indeterminable (ex *Hook. fil. Fl. Br. Ind.* v. 113).

M. integrifolia, *Steud. Nomencl.*, is *Myrica integrifolia*, Wall. [*M. Nagi*, Thunbg.] (ex *Hook. fil. Fl. Br. Ind.* v. 113)

M. INTEGRA, *Wall. Cat.* 6799, from Singapore. The specimens are too imperfect for determination. It is probably a *Pyrrhosa* or *Irya*.

M. LEMANIANA, *A. DC. in Ann. Sc. Nat. Ser.* 4, *vol.* V, *p.* 31, & *Prod.* xiv. 1, 203. A species (Sect. *Pyrrhosa*) said to have been collected at Malacca, but of which I have seen no specimen.

M. LINIFOLIA, *Roxb. Fl. Ind.* iii. 847, is probably *M. longifolia*, Wall.; but the description is by far too brief for identification, and no authentic specimen now exists.

M. MICRANTHA, *Wall. Cat.* 6807, *A. DC. Prod.* xiv. 1, 208, is, according to M. DeCandolle, near *Irya*. It is a Siamese plant, and the material is very imperfect.

M. MONTANA, *Roxb. Fl. Ind.* iii. 846, is too imperfectly described for recognition in the absence of an authentic specimen. The plant distributed under this name by Wallich, Cat. 6792, is referred by A. DC. (*Prod.* xiv. 1, 190), and I think quite rightly, to *M. iners*, Bl.

M. ? OBTUSIFOLIA, *Wall. Cat.* 6808, from Singapore. The specimens consist of leaves only, which are probably Lauraceous.

M. SAPIDA, *Steud. Nomencl.*, is *Myrica sapida*, Wall., ex *A. DC. Prod.* xiv. 1, 208. (=*M. Nagi*, Thunbg., *Hook. fil. Fl. Br. Ind.* v. 113).

M. SESQUIPEDALIS, *Wall. Cat.* 6809, "an Laurin. fam.?" from Penang, is *Actinodaphne sesquipedalis*, H. f. & T. (ex *Hook. fil. Fl. Br. Ind.* v. 113 & 150).

MYRISTICA, *Wall. Cat.* 9017, from Silhet, does not belong to this genus (*Hook. fil. Fl. Br. Ind.* v. 113).

The following species, chiefly from the Moluccas, were described in the most imperfect manner by Roxburgh (*Fl. Br. Ind.* iii. *pp.* 846 & 847), and are not now, in the absence of authentic specimens, capable of identification:—

M. MACROPHYLLA, *Roxb.*

M. PELTATA, *Roxb.*

M. SALICIFOLIA, *Willd.*

M. SPICATA, *Roxb.*

M. PARVIFLORA, *Roxb.*

KNEMA GLAUCESCENS, *Wall. Cat.* 6810 (*not of Jack*), is referred by Sir J. D. Hooker (*Fl. Ind.* 159) to *Myristica furfuracea*, H. f. & T.; also by M. DeCandolle (*Prod.* xiv. 1, 206).

W. J.—Reg. No. 2972J—250—28.9.91.

INDEX TO MYRISTICA.

Actinodaphne sesquipedalis . 331
Caloneura, *A. DC.* . . 281, 286
Eumyristica, *H f. & T.* . 281, 286
Gymnacranthera, *A. DC.* . 283. 304
Horsfieldia, *A. DC.* . . 282, 296
„ *odorata*, Willd. . 296
Irya, *H. f. & T.* . . . 284, 307
Knema, *Blume* . . . 284, 313
„ *corticosa*, Lour. . 320, 321
„ *glaucescens*, Wall. . 318, 331
„ „ Jack . 323
Litsæa venulosa, Meissn. . 330
Melodorum fulgens, H. f. & T. . 330
Myrica integrifolia, Wall. . 330
„ *Nagi*, Thunbg. . . 330, 331
„ *sapida*, Wall. . . 331
Myristica, *Linn.* . . . 281
„ amygdalina, *Wall.* . 300
„ „ var. *Hookeri*, A. DC. . 328
„ *amygdalina*, Grah. . 316
„ „ Kurz . 310
„ andamanica, *Hook. fil.* . 294
„ *augustifolia*, Roxb. . 321, 330
„ *aromatica*, Lamk. . 288
„ attenuata, *Wall.* . 316
„ Beddomei, *King* . 291
„ bivalvis, *Hook. fil.* . 307
„ brachiata, *King* . 311
„ bracteata, *A. DC.* . 286
„ *calocarpa*, Miq. . 295
„ Canarica, *Bedd.* . 307
„ canarioides, *King* . 304
„ Cantleyi, *Hook. fil.* . 327
„ Ceylanica, *A. DC.* . 289
„ cinnamonea, *King* . 292
„ Clarkeana, *King* . 325
„ Collettiana, *King* . 312
„ conferta, *King* . 315
„ *corticosa*, H. f. & T. 320, 321, 324
„ „ var. *decipiens*, Miq. 318
„ „ var. *Sumatrana*, Miq. 320
„ „ Bl. var. *lanceolata*, Miq. . 321
Myristica, *corticosa*, A. DC. . 323
„ „ Kurz . 322
„ „ Bedd. . 316
„ crassa, *King* . . 293
„ crassifolia, *H. f. & T.* 308
„ *crassifolia*, H. f. & T. 303
„ Curtisii, *King* . 326
„ *dactyloides*, Gærtn. . 290
„ „ Wall. . 288
„ *diospyrifolia*, A. DC. 290
„ elliptica, *Wall.* . 295
„ *elliptica*, Kurz . 294
„ erratica, *H. f. & T.* . 323
„ *eugeniæfolia*, A. DC. 330
„ exaltata, *Wall.* . 327; 300, 309
„ Farquhariana, *Wall.* 305
„ „ var. major, *King* 306
„ *Farquhariana*, A. DC 307
„ ferruginea, *Wall.* . 298; 296
„ *Finlayosniana*, Wall. 330
„ flocculosa, *King* . 302
„ *floribunda*, Wall. . 300
„ Forbesii, *King* . 306
„ fragrans, *Houtt.* . 287
„ fulva, *King* . . 297
„ furfuracea, *H. f. & T.* 318, 331
„ „ var. major, *King* 319
„ geminata, *Miq.* . 322
„ gibbosa, *H. f. & T.* 321, 323
„ gigantea, *King* . 288
„ glabra, *Blume* . 310
„ „ var. *Sumatrana*, Miq. . 313
„ glauca, *Blume* . 320, 321
„ „ var. *Sumatrana*, Miq. 320
„ glaucescens, *H. f. & T.* . 323
„ *glaucescens*, Hook. fil. 320, 321
„ „ Wall. . 330
„ *glomerata*, Miq. . 296
„ *globularia*, Blume . 308
„ „ H. f. & T. . 312
„ Griffithii, *H. f. & T.* 304
Myristica *Heyneana*, Wall. . 330
„ *Hookeri*, Wall. . 330
„ Hookeriana, *Wall.* . 325
„ *Horsfieldia*, Blume . 296
„ „ Wall. . 303, 311, 312
„ Horsfieldii, *Blume* . 296
„ *Horsfieldii*, Wall. . 308
„ *iners*, Blume . . 293, 331
„ *integra*, Wall. . 310, 331
„ *integrifolia*, Steud. . 330
„ intermedia, *Blume* . 317
„ „ var. *minor*, Miq. . 323
„ Irya, *Gærtn.* . 308
„ „ var. *crassifolia*, Miq . . 308
„ „ var. longifolia, *King* . . 309
„ „ var. Wallichii, *King* . . 309
„ *Iryaghedi*, Gærtn. . 296
„ *Javanica*, Blume . 309
„ Kingii, *Hook. fil.* . 300
„ Kunstleri, *King* . 314
„ *Kurzii*, King MSS. 310
„ *lanceolata*, Wall. . 321
„ laurina, *Blume* . 319
„ „ var. *Borneensis*, Miq. . 317
„ laurifolia, *H. f. & T.* 290
„ „ var. *Ceylanica*, H. f. & T. . 289
„ *laurifolia*, Bedd. . 291
„ *Lemaniana*, A. DC. 331
„ *linifolia*, Roxb. . 324, 331
„ longifolia, *Wall.* . 324
„ „ var. *erratica*, H. f. & T. 324
„ Lowiana, *King* . 293
„ *macrocoma*, Miq. . 328
„ *macrophylla*, Roxb. 331
„ magnifica, *Bedd.* . 291
„ Maingayi, *Hook. fil.* 294
„ majuscula, *King* . 310
„ Malabarica, *Lamk.* 288
„ Malaccensis, *H. f. & T.* . 287

Myristica *micrantha*, Wall. . 331
„ *montana*, Roxb. . 331
„ Missionis, *Wall.* . 321
„ *moschata*, Thunbg. 287
„ Murtoni, *Hook. fil.* 297
„ *notha*, Wall. . 288
„ oblongifolia, *King* . 313
„ „ var. monticola, *King* 314
„ *obtusifolia*, Wall. . 331
„ *officinalis*, Linn. fil. 287
„ paludicola, *King* . 328
„ *Palembanica*, Miq. 323
„ *parviflora*, Roxb. . 331
„ *peltata*, Roxb. . 331
„ pendulina, *Hook. fil.* 329
Myristica polyspherula, *Hook. fil.* . . . 312
„ Prainii, *King* . . 299
„ racemosa, *King* . 328
„ retusa, *King* . . 330
„ Ridleyana, *King* . 311
„ rubiginosa, *King* . 302
„ *salicifolia*, Willd. . 331
„ *sapida*, Steud. . 331
„ Scortechinii, *King* . 317
„ *sesquipedalis*, Wall. 331
„ *Spanogheana*, Miq. 316
„ *spicata*, Roxb. 331
„ *sphærocarpa*, Wall. 309
„ *sphærula*, Hook. fil. 321
„ suavis, *King* . . 295
Myristica *subglobosa*, Miq. . 312
„ *succedanea*, Reinw. 295
„ sucosa, *King* . . 301
„ *Sumatrana*, Blume 320
„ superba, *H. f. & T.* 298
„ *sycocarpa*, Miq. . 295
„ *sylvestris*, Houtt. . 329
„ tomentosa, *H. f. & T.* . 301
„ *tomentosa*, Blume . 319
„ „ Grah. . 288
„ *Vrieseana*, Miq. . 309
„ Wallichii, *H. f. & T.* 303
„ Wrayi, *King* . . 315
Myristicacea, Wall. . . 302
Pyrrhosa, *Blume* . . 282, 297
„ *Horsfieldii*, Wight . 296

GENERAL INDEX TO VOL. III.

Abelia 50
Acaules 91; 19
Actinodaphne sesquipedalis, H. f. & T. 331
Adenosma biplicata, Nees . . 187
ADUNCÆ, Prain . . . 74, 146
Amœnæ 94
ANODONTÆ, Bunge . . . 91, 168
Anthocoma, *Prain* . . . 250; 243
ANTHOCOMA, Zoll. . . . 231
Anthocoma flavescens, Zoll. . . 232
Aromadendron, Blume . . . 205
Asplenifoliæ 79
Axillares 73
Bara Champ 215
Bicuspidatæ 18
BIDENTATÆ, Maxim. . . 85, 165
Boramthuri 205
„ *Soppa* 207
Bor Gahori Soppa 210
Bor Soppa 218
Brevifoliæ 72
Brevilabres 98
Brevitubæ 69
Cæspitosæ 78
Caloneura, *A. DC.* . . 281, 286
Canadenses 91
Capitatæ 92
Cardanthera avana, Clarke . . 187
„ *biplicata*, Benth. . 187
Carnosæ 77
Caucasicæ 98
Champ 216
Cheilanthifoliæ 93
Collata 97
Comosæ 87
Conifera 85
Curvipes 76
Debiles 72
Denudatæ 96
Dolichorrhiza 89
Edentulæ 18
Elata 87
Elongatæ 78
Eriocarpon, *Prain* . . . 258; 244
EROSTRES, Prain . . . 91, 168
EUGOMPHOSTEMMA, Prain . 259; 244
EUMYRISTICA, H. f. & T. . 281, 286
Euorthorrhynchæ 72
EUPHRASIEÆ 6, 47
Euptelea 199
„ pleiosperma, *H. f. & T.* 199
„ *polyandra*, Sieb. & Zucc. . . . 199
Eurhynchiolophæ 80
Eusiphonanthæ 67
EUTALAUMA 202
Exaltatæ 99
Excelsa 81
Faucidentes 18
Filicifolia 73; 58
Flagellares 20
Flammeæ 100
Flexuosæ 73; 58
Foliosæ 98
Fragiles 97; 58
Franchetiana 70
Furfuraceæ 75
Gahori Soppa 210
Gibberæ 96
Gloriosæ 92
Gogay Champ 215
Gomphostemma 242
„ *acaule*, Kurz . 247
„ chinense, *Oliv.* 267
„ *chinensis*, Forbes & Hemsl. . 267
„ crinitum, *Wall.* 254
„ „ VAR. Griffithii, *Prain* . 254
„ crinitum VAR. typica . . 254
„ Curtisii, *Prain*. 266
„ *dichotomum*, Hassk. . 232
„ *dichotomum*, Zoll. & Mor. 252
„ *elatius*, Wall. . 245
„ eriocarpon, *Benth.* . 258
„ *eriocarpum*, Benth. . 259
„ flavescens, *Miq.* 232, 250
„ Hemsleyanum, *Prain* . 250
„ Heyneanum, *Wall.* 248, 249
„ Heyneanum, VAR. Rottleri, *Prain* . 249
„ Heyneanum, VAR. typica . 248
Gomphostemma *insane*, Hance 238
„ javanicum, *Benth.* . 261
„ lucidum, *Wall.* 263, 265
„ „ VAR. canescens, *Prain* . 268
„ lucidum VAR. typica . 263
„ *lucidum*, Wall. 262
„ *macrophyllum*, Miq. . 231
„ Mastersii, *Benth.* . 268
„ *melissæfolium*, Benth. 270
„ melissifolium, *Wall.* . 270
„ *membranifolium*, Miq. 231
„ microcalyx, *Prain* 251, 258
„ *multiflorum*, Benth. . 253
„ *multiflorum*, Herb. Linn. Soc. . . 252
„ niveum, *Hook. f.* . . 250
„ nutans, *Hook. f.* . . 248
„ oblongum, *Wall.* . 251, 265
„ oblongum, VAR.? *Helferi*, Hook. f. . . 260
„ *oblongum*, Miq. 261
„ „ Meritzi 261
„ „ Wight 250
„ ovatum, *Wall.* . 269
„ „ VAR. flaccida, *Prain* . 270
„ ovatum VAR. typica . 270
„ parviflorum, *Wall.* 262, 258
„ parviflorum VAR. farinosa, *Prain* . 253
„ parviflorum VAR. typica . 252
„ *parviflorum*, Benth. . 254

Gomphostemma *parviflorum*, H. f. & T. . 251
„ peduncula-tum, *Benth.*. 266
„ *petiolare*, Miq. 231
„ Philippina-rum, *Benth.*. 259
„ phlomoides, *Benth.* 264, 265
„ *radicans*, Wall. 269
„ rugosum, *Prain* 262
„ Scortechinii, *Prain* . . 260
„ Scortechinii VAR.? Hel-feri, *Prain* . 260
„ Scortechinii VAR. typica . 260
„ strobilinum, *Wall.* . 246, 249
„ strobilinum VAR. acaulis, *Prain* . . 247
„ strobilinum *VAR. elatius*, Benth. . 245
„ strobilinum *VAR. Hey-neana*, Hook. f. . . 248
„ strobilinum VAR. typica . 246
„ strobilinum VAR. viridis, *Hook. f.* . 247
„ *strobilinum*, Benth. . 245
„ Thomsoni, *Benth* . . 251
„ velutinum, *Benth.* . 269
„ *viride*, Wall. . 247
„ Wallichii, *Prain* . 245
Gordonia terminalis, Wall. . . 201
Graciles 72
Grandiflora 93
GYMNACRANTHERA, A. DC. . 283, 304
Gyrorrhynchæ 70
Hemsleyanum, *Prain* . . 249; 243
Hirsutæ 100
Hirtella 89
Horsfieldia, *A. DC.* . . 282, 296
„ *odorata*, Willd. . . 296
Hyporthorrhynchæ . . . 83
Hyposiphonanthæ . . . 74
Illicium 199
„ cambodianum, *Hance* . 200
„ *floridanum*, Ell. . . 200
„ Griffithii, *H. f. & T.* . 201
„ majus, *H. f. & T.* . 201
„ manipurense, *Watt* . 200
„ Simonsii, *Maxim.* . . 201
Integrifolia 70
IRYA, H. f. & T. . . . 284, 307
Kadsura 221
Kadsura cauliflora, *Bl.* . . 222
„ *japonica*, Wall. . . 222
„ lanceolata, *King* . 223
„ *propinqua*, Wall. . . 220
„ Roxburghiana, *Arn.* . 222
„ scandens, *Bl.* . . 221
„ Wightiana, *Arn.* . . 222
KNEMA, Blume . . . 284, 313
„ *corticosa*, Lour. . 320, 321
„ *glaucescens*, Jack . . 323
„ „ Wall. . 318, 331
Korika Soppa 206
Lachnoglossæ 81
Lal Champ 208
Leonurus farinosus, Ham. . . 253
„ *javanicus*, Blume . . 231
„ *oblongifolius*, Blume . 231
„ *tomentosus*, Herb. Madr. 259
Limnogena 98
Liriodendron grandiflorum, Roxb. 207
Litsæa venulosa, Meissn. . . 330
Longicaulis 85
Longifloræ 67
Longipedes 74
LONGIROSTRES, Maxim. . 67, 109
Lucida, *Prain* . . . 259; 244
Lyratæ 85
Macranthæ 69
MAGNOLIÆ 199
Magnolia 200, 206
„ *andamanica*, King . 203
„ Campbellii, *H. f. & T.* 208
„ *excelsa*, Wall. . . 215
„ *Forbesii*, King . . 206
„ globosa, *H. f. & T.* . 208
„ Griffithii, *H. f. & T.* . 209
„ Gustavi, *King* . . 209
„ *insignis*, Wall. . . 212
„ *Kunstleri*, King . . 204
„ *Mannii*, King . . 218
„ Maingayi, *King* . . 208
„ Pealiana, *King* . . 210
„ pterocarpa, *Roxb.* . . 207
„ *punduana*, Wall. . . 217
„ *Scortechinii*, King . 213
„ *sphenocarpa*, Wall. . 207
Manglietia 211
„ *Candollei*, Wall. . 203
„ Caveana, *H. f. & T.* 212
„ glauca, *Bl.* . . 213
„ insignis, *Bl.* . . 211
„ „ VAR. angus-tifolia, *King* . 212
„ *insignis*, Wall. . 204
„ Sebassa, *Miq.* . . 211
„ Scortechinii, *King* . 213
Megalanthæ 68
Melampyrifolia 86
MELIACEÆ 50
Melissifolia, *Prain* . . . 268; 244
Melodorum fulgens, H. f. & T. . 33
Michelia 214
„ *aurantiaca*, Wall. . 216
„ Catheartii, *H. f. & T.* 214
„ Champaca, *Linn.*. . 216
„ *Doldsopa*, Ham. . . 216
„ excelsa, *Bl.* . . 215
„ *glauca*, Wight . . 216
„ *Gustavi*, King . . 209
„ Kisopa, *DC.* . . 217
„ lanuginosa, *Wall.* . 215
„ *macrophylla*, Don . 204
„ Mannii, *King* . . 218
„ montana, *Bl.* . . 218
„ nilagirica, *Zenk.* . 216
„ „ VAR. Walkeri, *King* . . . 216
„ oblonga, *Wall.* . . 217
„ *ovalifolia*, Wight . . 216
„ *Pealiana*, King . . 210
„ *pubinervia*, Bl. . . 216
„ *pulneyensis*, Wight . 216
„ punduana, *H. f. & T.* 217
„ *Rheedii*, Wight . . 216
„ *rufinerus*, DC. . . 216
„ *velutina*, DC. . . 215
„ *Walkeri*, Wight . . 216
Microchila 93
Microphyllæ 76
Microtæna cymosa, Prain . . 233
Muscioclæ 68
Myrica integrifolia, Wall. . . 330
„ *Nagi*, Thunbg. . 330, 331
„ *sapida*, Wall. . . 331
Myriophyllæ 84
Myristica 281
„ amygdalina, *Wall.* . 300
„ „ *VAR. Hook-eri*, A. DC. . . 328
„ *amygdalina*, Grah. . 316
„ „ Kurz . 310
„ andamanica, *Hook. f.* . 294
„ *angustifolia*, Roxb. 321, 330
„ *aromatica*, Lamk. . . 288
„ attenuata, *Wall.* . . 316
„ Beddomei, *King* . . 291
„ bivalvis, *Hook. f.* . 307
„ brachiata, *King* . . 311
„ bracteata, *A. DC.* . . 286
„ *calocarpa*, Miq. . . 295
„ Canarica, *Bedd.* . . 307
„ canarioides, *King* . . 304
„ Cantleyi, *Hook. f.* . . 327
„ Ceylanica, *A. DC.* . . 289
„ cinnamomea, *King* . . 292
„ Clarkeana, *King* . . 325
„ Collettiana, *King* . . 312
„ conferta, *King* . . 315
„ *corticosa*, H. f. & T. 320. 321, 324
„ „ *VAR. decipiens*, Miq. 318
„ „ *VAR. Sumatrana*, Miq. 320

Myristica *corticosa*, Bl., VAR. *lanceolata*, Miq. . 321
„ *corticosa*, A. DC. . 323
„ „ Bedd. . 316
„ „ Kurz . 322
„ crassa, *King* . . 293
„ crassifolia, *H.f. & T.* 308
„ *crassifolia*, H. f. & T. 303
„ Curtisii, *King* . . 326
„ *dactyloides*, Gærtn. . 290
„ „ Wall. . 288
„ *diospyrifolia*, A. DC. 290
„ elliptica, *Wall.* . 295
„ *elliptica*, Kurz . . 294
„ erratica, *H.f. & T.* . 323
„ *eugeniæfolia*, A. DC. 330
„ exaltata, *Wall.* 327; 300, 309
„ Farquhariana, *Wall.* 305
„ „ VAR. major, *King* . 306
„ *Farquhariana*, A. DC. 307
„ ferruginea, *Wall.* 298; 296
„ *Finlaysoniana*, Wall. 330
„ flocculosa, *King* . 302
„ *floribunda*, Wall. . 300
„ Forbesii, *King* . 306
„ fragrans, *Houtt.* . 287
„ fulva, *King* . . 297
„ furfuracea, *H.f. & T.* 318, 331
„ „ VAR. major, *King* . . 319
„ geminata, *Miq.* . 322
„ gibbosa, *H. f. & T.* 321, 323
„ gigantea, *King* . . 288
„ glabra, *Blume* . . 310
„ „ *VAR. Sumatrana*, Miq. . . 313
„ glauca, *Blume* . 320, 321
„ „ *VAR. Sumatrana*, Miq. . . 320
„ glaucescens, *H.f. & T.* 323
„ *glaucescens*, Hook. f. 320, 321
„ „ Wall. . 330
„ *glomerata*, Miq. . 296
„ *globularia*, Blume . 308
„ „ H. f. & T. 312
„ Griffithii, *H.f. & T.* 304
„ *Heyneana*, Wall. . 330
„ *Hookeri*, Wall. . 330
„ Hookeriana, *Wall.* . 325
„ *Horsfieldia*, Blume . 296
„ „ Wall. . 303, 311, 312
„ Horsfieldii, *Blume* . 296
„ *Horsfieldii*, Wall. . 308
„ *iners*, Blume 293, 331
„ *integra*, Wall. 310, 331
„ *integrifolia*, Steud. . 330
„ intermedia, *Blume* . 317
„ „ *VAR. minor*, Miq. . . 323

Myristica Irya, *Gaertn.* . . 308
„ „ *VAR. crassifolia*, Miq. . . 308
„ Irya, VAR. longifolia, *King* . . . 309
„ Irya, VAR. Wallichii, *King* . . . 309
„ *Iryaghedi*, Gærtn. . 296
„ *Javanica*, Blume . 309
„ Kingii, *Hook. f.* . 300
„ Kunstleri, *King* . 314
„ *Kurzii*, King MSS. . 310
„ *lanceolata*, Wall. . 321
„ laurina, *Blume* . 319
„ *VAR. Borneensis*, Miq. . 317
„ laurifolia, *H. f. & T.* 290
„ *VAR. Ceylanica*, H. f. & T. 289
„ *laurifolia*, Bedd. . 291
„ *Lemaniana*, A. DC. 331
„ *linifolia*, Roxb. 324, 331
„ longifolia, *Wall.* . 324
„ *VAR. erratica*, H. f. & T. . 324
„ Lowiana, *King* . 293
„ *macrocoma*, Miq. . 328
„ *macrophylla*, Roxb. . 331
„ magnifica, *Bedd.* . 291
„ Maingayi, *Hook. f.* 294
„ majuscula, *King* . 310
„ Malabarica, *Lamk.* . 288
„ Malaccensis, *H. f. & T.* . . . 287
„ *micrantha*, Wall. . 331
„ *montana*, Roxb. . 331
„ Missionis, *Wall.* . 321
„ *moschata*, Thunbg. . 287
„ Murtoni, *Hook. f.* . 297
„ *notha*, Wall. . . 288
„ oblongifolia, *King* . 313
„ VAR. monticola, *King* 314
„ *obtusifolia*, Wall. . 331
„ *officinalis*, Linn. f. . 287
„ paludicola, *King* . 328
„ *Palembanica*, Miq. . 323
„ *parviflora*, Roxb. . 331
„ *peltata*, Roxb. . . 331
„ pendulina, *Hook. f.* 329
„ polyspherula, *Hook. f.* . . . 312
„ Prainii, *King* . . 299
„ racemosa, *King* . 328
„ retusa, *King* . . 330
„ Ridleyana, *King* . 311
„ rubiginosa, *King* . 302
„ *salicifolia*, Willd. . 331
„ *sapida*, Steud. . 331
„ Scortechinii, *King* . 317
„ *sesquipedalis*, Wall. 331
„ *Spanogheana*, Miq. 316
„ *spicata*, Roxb. . 331

Myristica *sphaerocarpa*, Wall. . 309
„ *spherula*, Hook. f. . 321
„ suavis, *King* . . 295
„ *subglobosa*, Miq. . 312
„ *succedanea*, Reinw. . 295
„ sucosa, *King* . . 301
„ *sumatrana*, Blume . 320
„ superba, *H.f. & T.* . 298
„ *sycocarpa*, Miq. . 295
„ *sylvestris*, Houtt. . 320
„ tomentosa, *H. f. & T.* 301
„ *tomentosa*, Blume . 319
„ „ Grah. . 288
„ *Trimenia*, Miq. . 303
„ Wallichii, *H. f. & T.* 303
„ Wrayi, *King* . . 316
Myristicaceæ, Wall. . . 302
Niveum, *Prain* . . . 250; 243
Oligantha 75
Ophiocephala 94
ORTHORRHYNCHUS, Prain . 70, 120
Osteomeles 60
Oxycarpa 74
Palustres 90
Parviflora, *Prain* . . . 261, 243
Paucifoliata 80
Pectinata 68
Pedicularis 66
„ abrotanifolia, *M. Bieb.* 96
„ *abrotanifolia*, Herb. Ind. Or . . . 171
„ acaulis, *Walf.* . 91, 120
„ achilleæfolia, *Steph.* . 88
„ aduncа, *M. Bieb.* . 90
„ alaschanica, *Maxim.* 164; 84
„ Alberti, *Regel* 99, 181, 183
„ albiflora, *Prain* . 155; 79
„ Alopecuros, *Franchet* . 71
„ *alpina caule simplici, &c.*, Haller . . 182
„ altaica, *Steph.* . . 87
„ amœna, *Ad.* . . 94
„ *amœna*, Maxim. . . 173
„ anas, *Maxim.* . . 93
„ angustifolia, *Benth.* . 90
„ apodochila, *Maxim.* . 88
„ armata, *Maxim.* . 67
„ Artselari, *Maxim.* 91, 170
„ asparagoides, *Lapeyr.* 87
„ asplenifolia, *Flœrke* 79, 156, 157
„ *asplenifolia*, Baumg. . 186
„ „ Wall. . 157
„ *asplenifolia*, Hook. f. 157
„ „ VAR. *altaica*, Hook. f. . 156
„ *asplenifolia*, VAR. ? *pubescens*, Hook. f. 121
„ atropurpurea, *Nordm.* 90
„ atrorubens, *Schleich.* 78
„ attollens, *A. Gray* . 80

Pedicularis *avana*, Wall. . . 187
„ axillaris, *Franchet* . 74
„ Barrelieri, *Reichb.* . 78
„ bella, *Hook. f.* . 120; 69
„ bicornuta, *Klotzsch* 115; 68
„ *bicornuta* × *megalantha* 117
„ bidentata, *Maxim.* . 67
„ binaria, *Maxim.* . 84
„ Bourgeaui, *Maxim.* . 98
„ brachyodonta, *Schloss. & Vukot.* . . 87
„ brachystachys, *Bunge.* 81
„ bracteosa, *Benth.* . 98
„ brevifolia, *Don* . 134; 72
„ *brevifolia*, Hook. f. . 142
„ *Brunoniana*, Wall. . 137
„ *cabulica*, Benth . . 168
„ cadmea, Boiss. . . 98
„ cæspitosa, *Sieber* . 78
„ campestris, *Griseb. & Schrenk* . . . 88
„ canadensis, *Linn.* . 91
„ capitata, *Ad.* . . 92
„ carnosa, *Wall.* . 151; 77
„ caucasica, *M. Bieb.* . 98
„ cenisia, *Gaud.* . . 78
„ centranthera, *A. Gray* 92
„ cephalantha, *Franchet* 75
„ Chamissonis *Stev.* 84, 164
„ cheilanthifolia, *Schrenk* . 171; 93
„ chinensis, *Maxim.* 67, 112
„ chorgossica, *Rgl & Winkl.* . . 86
„ chumbica, *Prain* 144; 73
„ Clarkei, *Hook. f.* 161; 83
„ collata, *Prain* . 177; 97
„ Collettii, *Prain* . 154; 77
„ comosa, *Linn.* . . 88
„ compacta, *Steph.* . 82
„ comptoniæfolia, *Franchet* . . 166; 68
„ condensata, *M. Bieb.* 98
„ confertiflora, *Prain* 142; 72
„ conifera, *Maxim.* . 85
„ contorta, *Benth.* . 81
„ corymbosa, *Prain* 152; 77
„ cranolopha, *Maxim.* 67
„ craspedotricha, *Maxim.* . . . 82
„ crassirostris, *Bunge* . 84
„ crenata, *Maxim.* 77, 151, 152
„ crenulata, *Benth.* . 91
„ cristata, *Maxim.* . 71
„ curvipes, *Hook. f.* 151; 76
„ curvituba, *Maxim.* 84, 165
„ Daltoni, *Prain* . 121; 69
„ Davidi, *Franchet* . 74
„ debilis, *Franchet* . 72
„ Delavayi, *Franchet* . 67
„ deltoidea, *Franchet* . 85
„ densiflora, *Benth.* . 98
Pedicularis densispica, *Franchet* . 96
„ denudata, *Hook. f.* 176; 96
„ dolichorrhiza, *Schrenk* . 167; 89
„ elata, *Willd.* . . 87
„ elegans, *Ten.* . . 78
„ elephantoides, *Benth.* 117; 68
„ *Elephas*, Benth. . 110
„ „ Boiss. 115, 110, 113
„ elongata, *Kerner* . 78
„ Elwesii, *Hook. f.* 158; 81
„ *eximia*, Watt . . 116
„ Fetisowi, *Regel* . 71
„ filicifolia, *Hemsl.* . 73
„ Filicula, *Franchet* . 79
„ fissa, *Turcz* . . 87
„ *fissa*, Hook. f. . 168
„ flagellaris, *Benth.* 150; 76
„ flammea, *Linn.* 100, 183
„ *flammea*, Oeder . 182
„ flava, *Pallas* . . 88
„ flexuosa, *Hook. f.* 143; 73
„ foliosa, *Linn.* . . 98
„ *foliosa*, Gunner . 182
„ fragilis, *Prain* 178; 97
„ Franchetiana, *Maxim.* . . . 70
„ Friderici Augusti, *Tommas.* . . 88
„ Furbishiæ, *S. Wats.* 90
„ furfuracea, *Wall.* 147; 75
„ „ *VAR. integrifolia*, Hook. f. 148
„ Gammieana, *Prain* 162; 84
„ Garckeana, *Prain* 122; 69
„ geminata, *Portenschlag* . 79; 166
„ gibbera, *Prain* 174; 96
„ globifera, *Hook. f.* 170; 93
„ gloriosa, *Biss. & Moore* 92
„ gracilis, *Wall.* 137; 72
„ græca, *Bunge* . . 88
„ grandiflora, *Fisch.* . 93
„ grœnlandica, *Retz.* . 80
„ gruina, *Franchet* 149; 76
„ gyroflexa, *Vill.* . 78
„ gyrorrhyncha, *Franchet* . . . 70
„ Henryi, *Maxim.* . 76
„ heterodonta, *Panč.* . 87
„ Heydei, *Prain* 140; 72
„ *himalaica*, Klotzsch 114
„ hirsuta, *Linn.* . . 100
„ *hirsuta*, Sm. . . 182
„ hirtella, *Franchet* . 89
„ *Hoffmeisteri*, Hook. f. 113
„ *Hoffmeisteri*, Klotzsch 118
„ *Hookeriana*, Aitch . 114
„ „ Wall. . 114
„ Howellii, *A. Gray* . 82
„ incarnata, *Jacq.* . 78
Pedicularis *incarnata* × *recutita* 18
„ incurva, *Benth.* . 80
„ ingens, *Maxim.* . 83
„ instar, *Prain* 136; 72
„ integrifolia, *Hook. f.* 128; 70
„ interrupta, *Steph.* . 86
„ kansuensis, *Maxim.* . 94
„ Keiskei, *Franch. & Savat.* . . 73
„ Kingii, *Prain* 179; 97
„ *labellata*, Benth. . 114
„ „ Boiss. . 114
„ „ Hook. f. 113
„ „ Jacquem . 110
„ lachnoglossa, *Hook. f.* . . 159; 81
„ læta, *Stev.* . . 88
„ lanata, *Willd.* . . 100
„ lanceolata, *Michx* 77, 154
„ Langsdorfii, *Fisch.* . 100
„ *lanigera*, Wall. 134, 152
„ lapponica, *Linn.* . 82
„ lasiophrys, *Maxim.* 82
„ lasiostachys, *Bunge* 88
„ *leiandra*, Franchet . 58
„ leptorhiza, *Rupr.* . 96
„ leucodon, *Griseb.* . 88
„ likiangensis, *Franchet* . . . 94
„ limnogena, *Kerner* . 99
„ lineata, *Franchet* . 94
„ longepetiolata, *Franchet* . . . 75
„ longicaulis, *Franchet* . . . 85
„ longiflora, *Rudolph* 112; 67
„ longipes, *Maxim.* . 74
„ lusitanica, *Link & Hoffmg* . . 90
„ lutescens, *Franchet* 85, 165
„ lyrata, *Prain* 165; 85
„ macilenta, *Franchet* 74
„ macrantha, *Klotzsch* 125; 66
„ macrosiphon, *Franchet* . . . 68
„ mandshurica, *Maxim.* 88
„ Maximowiczii, *Krasn.* 92
„ megalantha, *Don* . 117
„ *melampyriflora*, Franchet . 58
„ melampyrifolia, *Franchet* . . 86
„ Menziesii, *Benth.* . 93
„ mexicana, *Zuccar.* . 81
„ microcalyx, *Hook. f.* 149; 75
„ microchila, *Franchet* 93
„ mixta, *Gren. & Godr.* 78
„ mollis, *Wall.* 176; 96
„ moschata, *Maxim.* . 96
„ moupinensis, *Franchet* . . 73

Pedicularis muscicola, *Maxim.* 63, 120
„ myriophylla, *Pallas* 84, 165
„ nasuta, *M. Bieb.* . 87
„ nepalensis, *Prain* 124; 69
„ Nordmanniana, *Bunge* . . 78
„ occulta, *Janka* . 88
„ *ochroleuca*, Duthie . 126
„ odontophora, *Prain* 155; 78
„ Oederi, *Vahl* 181; 100
„ *Olgæ*, Regel . . 180
„ oligantha, *Franchet* 75
„ Oliveriana, *Prain* 133; 71
„ olympica, *Boiss.* . 100
„ ophiocephala, *Maxim.* . . 172; 93
„ Orizabæ, *Cham. & Schlecht.* . 81
„ ornithorrhyncha, *Benth.* . . 79
„ orthantha, *Griseb* .. 99
„ *orthantha*, Maxim. 180
„ oxycarpa, *Franchet* 74
„ palustris, *Linn.* . 90
„ Pantlingii, *Prain* 148; 75
„ Parryi, *A. Gray* 81, 160
„ *patens*, Royle. . 181
„ pectinata, *Wall.* 129; 71
„ „ *VAR. pyramidata*, Hook. f. . 130
„ *pectinata*, Aitch. . 132
„ pedicellata, *Bunge* . 79
„ Perrottetii, *Benth.* 119; 68
„ petiolaris, *Ten.* . 88
„ physocalyx, *Bunge* . 88
„ pilostachya, *Maxim.* 95
„ platyrrhyncha, *Schrenk* . . 86
„ plicata, *Maxim.* . 95
„ polygaloides, *Hook. f.* . . 175; 96
„ polyphylla, *Franchet* 76
„ pontica, *Boiss.* . 95
„ porrecta, *Wall.* 141; 72
„ *Portenschlagii*, Saut. . . 157
„ Potanini, *Maxim.* . 79
„ Prainiana, *Maxim.* 162; 83
„ proboscidea, *Stev.* . 81
„ procera, *A. Gray* . 90
„ Przewalskii, *Maxim.* . 120; 69
„ *punctata*, Dene . 114
„ pycnantha, *Boiss.* 179; 98
„ pygmæa, *Maxim.* . 95
„ pyramidata, *Royle* 132; 71
„ *pyramidata*, Duthie. 132
„ „ Herb. Ind. Or. . . 130
„ pyrenaica, *Gay* . 78
„ racemosa, *Dougl.* . 77
„ recurva, *Maxim.* . 81
„ recutita, *Linn.* . 78
Pedicularis refracta, *Maxim.* . 94
„ Regeliana, *Prain* 169; 91
„ resupinata, *Linn.* . 77
„ rex, *Clarke* . 167; 86
„ rhinanthoides, *Schrenk* . 109; 67
„ *rhinanthoides*, Hook. f. . 110; 117
„ rhodotricha, *Maxim.* 82
„ rigida, *Franchet* . 86
„ Roborowskii, *Maxim.* 71
„ robusta, *Hook. f.* 123; 69
„ rosea, *Wulf.* . . 99
„ rostrata, *Linn.* 78; 156
„ Roylei, *Maxim.* 173; 93
„ rubens, *Steph.* . . 88
„ rudis, *Maxim.* 83; 162
„ *rudis*, Prain . . 162
„ rupicola, *Franchet* . 95
„ sajanensis, *Steph.* . 98
„ salviæflora, *Franchet* 97
„ sarawschanica, *Regel* 87
„ Sceptrum Carolinum, *Linn.* . . . 92
„ schizocalyx, *Lange* . 87
„ schizorrhyncha, *Prain* . 163; 84
„ Scolopax, *Maxim.* . 71
„ scopulorum, *A. Gray* 87
„ scullyana, *Prain* 127; 69
„ *Semenowi*, Regel . 180
„ semibarbata, *A. Gray* 92
„ semitorta, *Maxim.* 71; 133
„ sigmoidea, *Franchet* 67
„ sima, *Maxim.* . . 97
„ siphonantha, *Don* 113; 67
„ *siphonantha*, Hook. f. 110
„ songarica, *Schrenk* . 87
„ sp. . . . 187
„ spicata, *Pallas* . 94
„ striata, *Pallas* . 90
„ *stricta*, Wall. . . 137
„ strobilacea, *Franchet* 67
„ subrostrata, *C. A. Mey.* . . . 86
„ sudetica, *Willd.* . 87
„ sumana, *Spreng.* . 99
„ superba, *Franchet* . 86
„ sylvatica, *Linn.* . 90
„ szetschuanica, *Maxim.* . . . 94
„ Tartinowi, *Maxim.* . 84
„ tenuicaulis, *Prain* 144; 73
„ tenuirostris, *Benth.* 131; 71
„ *tenuirostris*, Aitch. . 132
„ tenuisecta, *Franchet* 76
„ ternata, *Maxim.* . 95
„ tianschanica, *Rupr.* . 71
„ torta, *Maxim.* . . 74
„ trichoglossa, *Hook. f.* . . 160; 82
„ tristis, *Linn.* . . 82
Pedicularis tsangchanensis, *Franchet* . . 80, 157
„ tuberosa, *Linn.* . 78
„ *tubiflora*, Fisch. . 112
„ *tubiformis*, Klotzsch 112
„ uliginosa, *Bunge* . 88
„ uncinata, *Steph* . 81
„ vagans, *Hemsl.* . 81
„ venusta, *Schang.* . 87
„ verbenæfolia, *Franchet* . . . 72
„ *versicolor*, Royle . 183
„ „ Wahlenb. 182
„ verticillata, *Linn.* 94, 174
„ *verticillata*, Benth . 173
„ *verticillata*, Walp. . 173
„ Viali, *Franchet* . 80
„ villosa, *Ledeb.* . 87
„ villosula, *Franchet* . 72
„ violascens, *Schrenk* . 94
„ *virescens*, Wahlenb. . 182
„ Wallichii, *Bunge* 156; 80
„ Wilhelmsiana, *Fisch.* 98
„ yezöensis, *Maxim.* 77, 154
„ yunnanensis, *Franchet* . . 80, 158
„ zeylanica, *Benth.* 153; 77
Pedunculata, *Prain* . . 265; 244
Personatæ 18
Phlomis javanica, *Prain* . . 231
„ oblongifolia, *Prain* . . 231
„ rugosa, *Benth.* . . . 231
„ ? sp., *Benth.* . . . 232
Phul Soppa 212, 213
Pilostachyæ 95
Platyrrhynchæ 86
Plicatæ 95
POGOSIPHON, Prain . . 245; 243
Pontica 95
PRASIEÆ, Benth. 228
PRASIUM, *Blume* 259
„ *Roxb.* 268
Prasium javanicum, Blume . . 262
„ *melissifolium*, Roxb. . 270
„ *phlomoides*, Reinw. 264; 262
Proboscideæ 81
Pseudasplenifolia 84
Pseudocæspitosæ 84
Pumiliones 69, 125
Pygmæa 95
PYRRHOSA, Blume . . . 282, 297
„ *Horsfieldii*, Wight . 296
Racemosæ 77
Recutitæ 78
Rhinanthoides 67
Rhinanthus bifidus, Ham. . . 151
RHYNCHOLOPHÆ, Bunge . . 74, 146
Rigidæ 86
Robustæ 69, 125
Roseæ 99
Rostratæ 78

Rubus 17
Rudes 83
Safed Champ 215
Salviæflora 97
Sarcocarpon scandens, Blume . 221
Saxifraga 17
Sceptra 91
SCHIZANDREÆ 199
Schizandra 219
„ axillaris, *H. f. & T.* . 220
„ elongata, *H. f. & T.* . 220
„ grandiflora, *H. f. & T.* 219
„ propinqua, *H. f. & T.* 220
Semitortæ 71
Sima 97
SIPHONANTHÆ, Benth. . . 67, 109
Sisymbrium pannonicum, Jacq. . 185
Sphærostema axillare, Blume . . 221
„ *elongatum*, Blume . 220
„ *grandiflorum*, Wall. . 220
Sphærostema grandiflorum, H. f. & T. 220
„ *propinquum*, Blume . 220
Sphenocarpus 207
SPONGOCARPON, King . . 202, 205
Stachys indica, Wall. . . . 249
„ „ Wight . . . 248
„ *orientalis*, Rottler . . 249
„ *tomentosa*, Heyne . . 248
STENOSTOMA, Prain . . 250; 243
Striatæ 89
Striatæ 90
Strobilina, *Prain* . . . 245; 242
Subsurrecta 80
Sudeticæ 87
Superbæ 86
Surrectæ 80
Synnema avanum, Benth. . . 187
Talauma 202
„ andamanica, *King* . . 203
„ Forbesii, *King* . . 206
Talauma Hodgsoni, *H. f. & T.* . 204
„ Kunstleri, *King* . . 204
„ lanigera, *H. f. & T.* . 202
„ mutabilis, *Blume* . . 203
„ phellocarpa, *King* . . 205
„ Rabaniana, *H. f. & T.* . 204
„ *Roxburghii*, G. Don . 207
„ spongocarpa, *King* . 205
„ villosa, *Miq.* . . . 203
Thalictrum 17
Tita Soppa 206
Torenia incisa, Heyne . . . 154
Tristes 82
TROCHODENDRIÆ 199
Turritis hirsuta, Jacq. . . . 185
Uvaria heteroclita, Roxb. . . 232
Vagans 81
Verticillatæ 94
VERTICILLATÆ . . . 22, 47, 58
WINTERIÆ 199

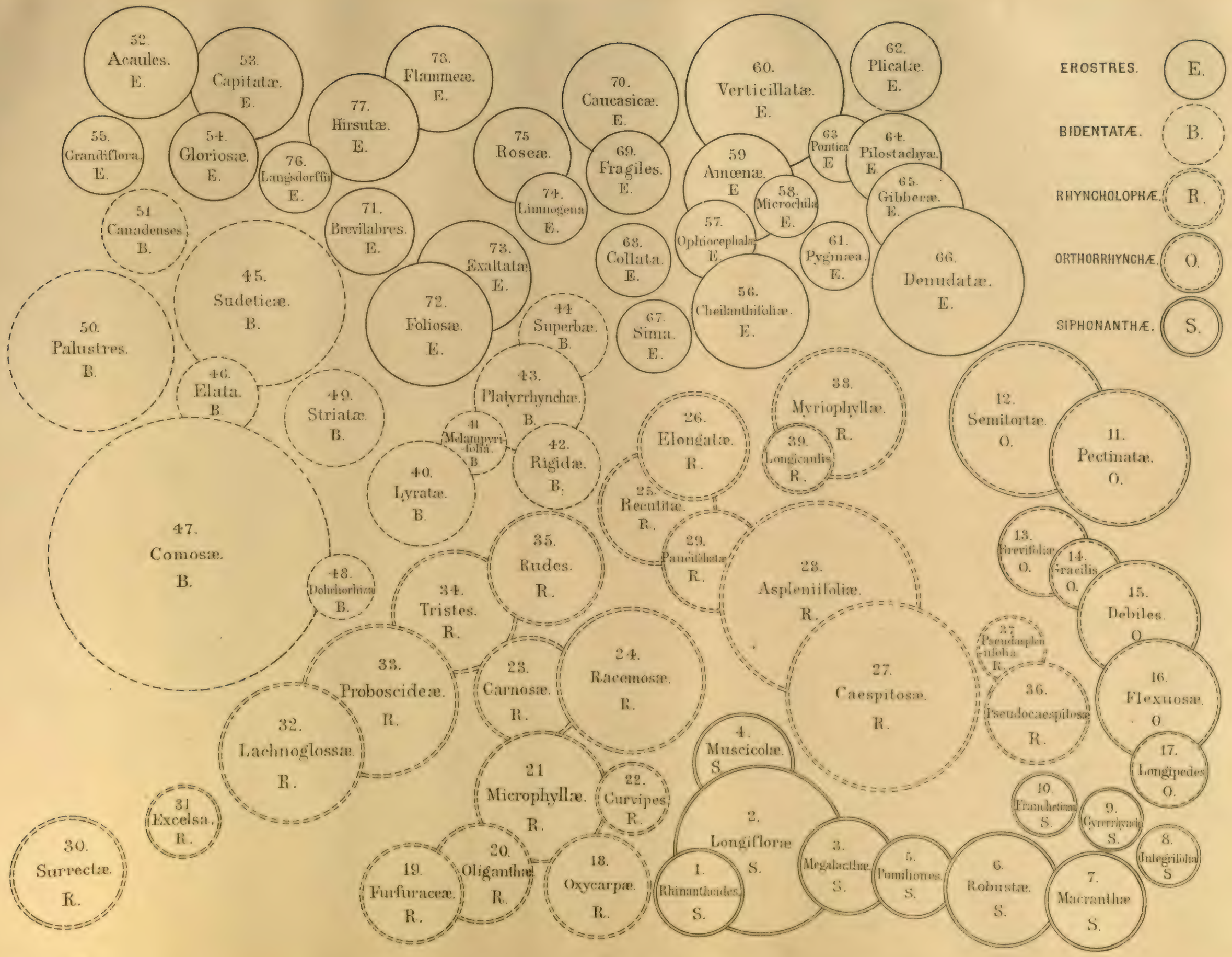
Prain Pedicularis. MAP.
[To accompany Chap. IV]

1 Circumpolar Province.
2 Europe.
3 Siberia-Turkestan.
4 Caucasus.
5 Japan.
6 China-Tibet.
7 Himalaya-Yunnan.
8 America.

SKETCH MAP of the Northern Hemisphere to illustrate the geographical distribution of PEDICULARIS.

D. Prain delt.

A. C. Mukerjie Lith.



TABULA AFFINITATUM.

D. Prain fecit.

A. C. Mukerjei Lith.

Prain Pedicularis. SCHEMA. [to accompany Chap. VI.]

A-D. PEDICULARIS RHINANTHOIDES, Schrenk. E.F. P. LONGIFLORA, Rudolph.

A. L. Singh, delt.

Lith. by A. C. Mukerjee

A. T. Mulla, del.

Lith. by A. C. Sapha, Govt. School of Art, Calcutta.

PEDICULARIS SIPHONANTHA, D.C.
A.B. Var. typica, C. Var. brevituba.

A. D. Mulls del.

Lith. by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

A. B. PEDICULARIS BICORNUTA, Klotzsch.

C. PEDICULARIS ELEPHANTOIDES, Benth.

A. D. Mulla, del.

Lith. by C. L. Day, Calcutta.

A. B. PEDICULARIS MEGALANTHA, Don. Var. typica, C. Var. pauciflora.

A. D. Mulla del.

Lith. v. J. F. Bhattacharji, Gov. Lithog. Art. Calcutta.

A. PERBELLARIS GARCKEANA Pr. B. P. BELLA, Hook. f. C. P. PRZEWALSKII Mazim. D. P. INTEGRIFOLIA, Hook. f.

G. C. Das, delt

A B. PEDICULARIS DALTONI, Prain. C.D. P. ROBUSTA, Hook f. E. P. NEPALENSIS, Prain.

Lith by A. C. Mukarjee.

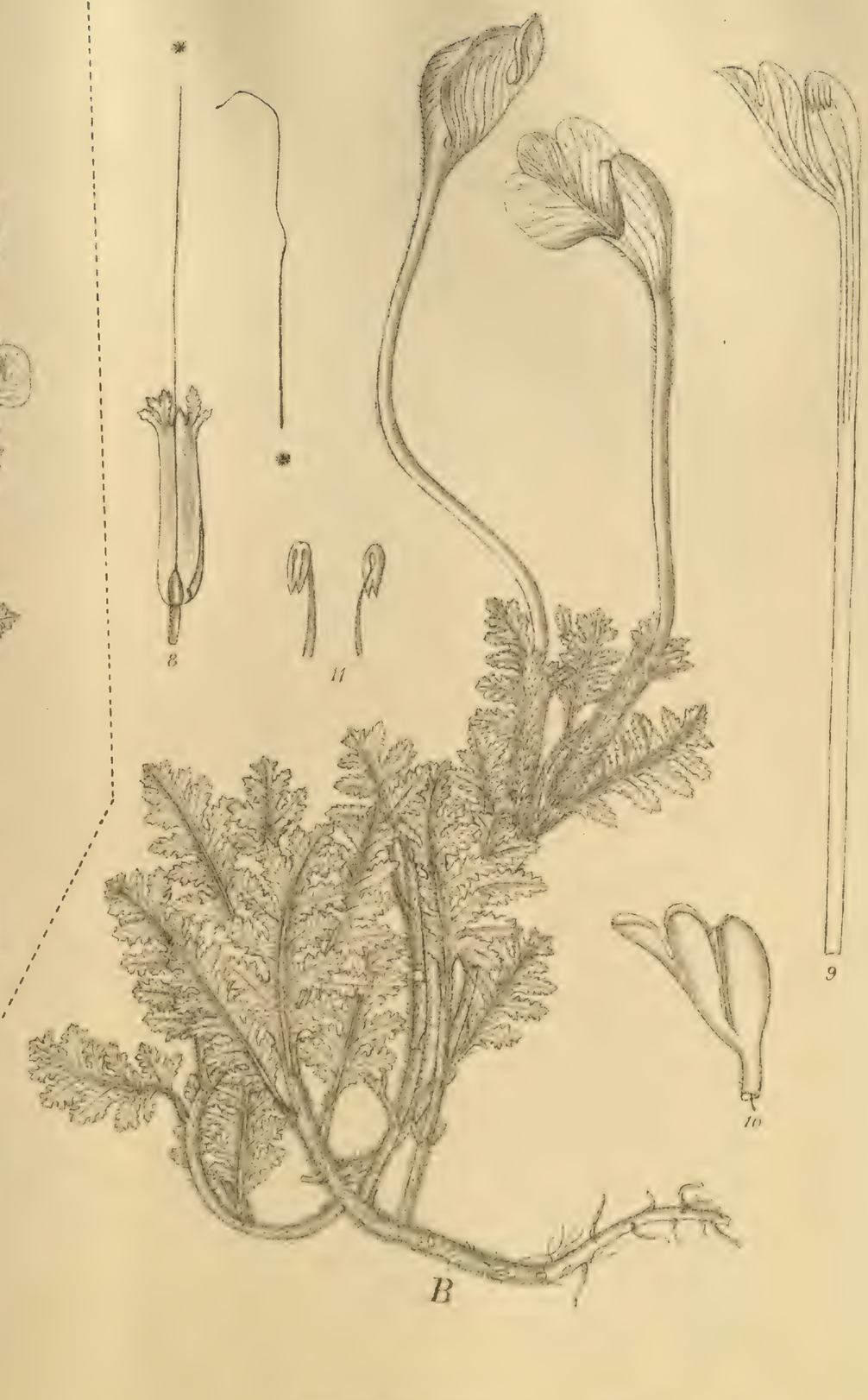
A. L. Singh del. Bot. Garden, Calcutta.

Lith. and Printed by Frostchen Lith.

PEDICULARIS MACRANTHA. Klotzsch. *A.B.* var typica *C.D.* var lutescens.

A. J. Singh. del.

A. PEDICULARIS ELWESII, Hook. f.



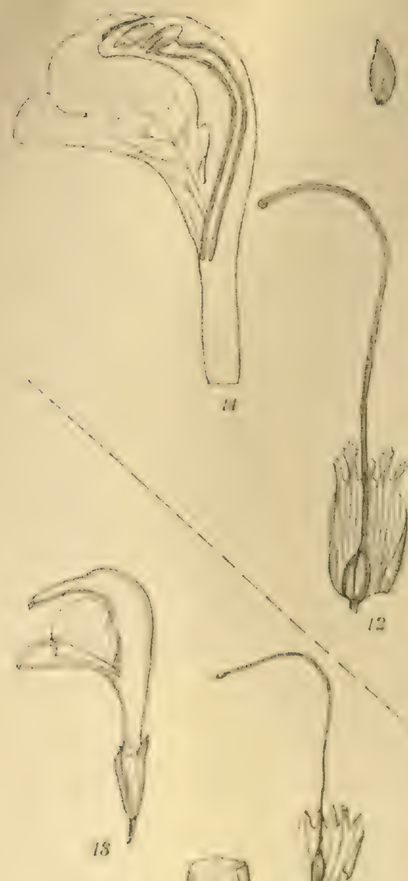
Lith. by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

B. PEDICULARIS PERROTTETII, Benth.

PEDICULARIS SCULLYANA, Prain.

Lith. by A.C. Mukerjei.

G.C. Das, delt.



A. D Mulla delt.

A. PEDICULARIS GRUINA, Franch. B. P. FLAGELLARIS, Benth. C. P. REGELIANA, Prain. D. P. ODONTOPHORA, Prain.

Lith. by A. C. Mukerjee

Prain. Pedicularis. PLATE 10.

A. L. Smith del.

Litho. by Bepin Behary Das, Govt. School of Art, Calcutta

Press Pedicularis. PLATE II.

A. PEDICULARIS CLARKEI. Hook. f. B. PEDICULARIS SIKKIMANA. Maxim.

A. L. Singh del.

Litho by Abhaya Ch. Chowdhury, Govt. School of Arts, Calcutta.

A. PEDICULARIS LACHNOGLOSSA. Hook f. B. PEDICULARIS TRICHOGLOSSA. Hook f.

Prem, Pedicularis, PLATE 13.

... del. Bot. Garden Calcutta.

Lith. by H.K. Chowdhri, Govt. School of Art Calcutta.

PEDICULARIS EXCELSA, Hook. f.

A. PEDICULARIS CARNOSA, Wall. B. P. CORYMBOSA, Pram. C. P. ZEYLANICA, Benth.

A. L. Singh, delt.

Lith. by A. C. Mukerjee.

A. PEDICULARIS COLLETTII, Prain. B. P. COMPTONIÆFOLIA, Franchet

A. D. Mulla del.

Lith. by A. C. Mukerjee

A.L. Singh, delt.

A. PEDICULARIS FURFURACEA, Wall B. P. PANTLINGII, Prain. C. P. MICROCALYX, Hook. f.

Lith. by A. C. Mukerjea

A. D. Mulla delt.

A.B. PEDICULARIS WALLICHII, Bunge.

Lith. by N.N. Bagchi, Govt. School of Art, Calcutta.

C.D. P. ALBIFLORA, Prain

Prain, Pedicularis, PLATE 17.

Ann. Roy. Bot. Garden, Calcutta, Vol. 5.

S. L. Smyth, lith.

A & B. PEDICULARIS FLEXUOSA, Hook. f.

Lith by A. C. Chowdhury, Govt. School of Art, Calcutta.

C & D. P. TENUICAULIS, Pram.

Pram, Pedicularis. PLATE 18.

A. L. Singh del. Bot. Garden, Calcutta.

Lith. by K. L. Chundra, Govt. School of Art, Calcutta.

PEDICULARIS GRACILIS, Wall. VAR. TYPICA.

A.C. PEDICULARIS PORRECTA. Wall.

A. L. Smyth del.

D.E.P. GRACILIS, Wall. var. typica.

Litd. by H. K. Chowdhury, Govt. School of Art, Calcutta.

A. L. Singh delt

Lith by K. D. Chandra, Govt. School of Art, Calcutta.

PEDICULARIS GRACILIS Wall. **A**–**C** var. MACROCARPA Prain; **D**, **E**. var. KHASIANA Hook.f.

A. PEDICULARIS OLIVERIANA. Prain

B. P. CHUMBICA. Prain

C. P. GAMMIEANA. Prain

A. L. Singh. del^t

Lith. by A. T. Mitra, Govt. School of Art, Calcutta

PEDICULARIS PECTINATA, WALL. A. VAR. TYPICA B. VAR. PALANS.

A. H. PEDICULARIS PYRAMIDATA Hook. & P. PEDICULARIS TENUIROSTRIS, Hooker.

Lith. by S. S. Roy, Government of Art, Calcutta.

A
B

A-C PEDICULARIS BREVIFOLIA Dec. D. INSTAE Pers. E. INSTAE [illegible]

A. L. Singh delt.

A-D. PEDICULARIS CONFERTIFLORA, Brain

Lith by A. C Singha, Government Press of Arts, Calcutta.

E. P. HEYDEI. Prain

A. P. Mula del Bot. Garden, Calcutta

Lith. by D. N. Gangoli, Govt. School of Art, Calcutta

A. PEDICULARIS KINGII. Pram B. PEDICULARIS PYCNANTHA. Boiss.

A. P. [illegible] Gibson Calcutta

Lith. and Printed by [illegible]

A. PEDICULARIS MOLLIS, Wall. B. P. GIBBERA, [illegible] C. P. P. [illegible] D. P. DENUDATA Hoxlet

Drawn [illegible] PLATE 14

A.L. Singh delt.

Lith by H.L. Pal, Govt. School of Art, Calcutta.

A. PEDICULARIS REX, Clarke. B. PEDICULARIS DOLICHORRHIZA. Schrenk.

A. PEDICULARIS FRAGILIS, Prain. B. P. LYRATA, Prain. C. P. COLLATA, Prain.

A B PEDICULARIS CHELLANTHIS [illegible] C [illegible] D [illegible]

A. PELICULARIS. PHILOCEPHALA. Mass. B. C. PLOTLES. Mass.

PETICULARES [illegible] VOL. A VIA TYPICA B C [illegible] LLOSS.

8. porrecta.

9. flexuosa.

7. pyramidata.

5. longiflora.

15. lyrata.

6. macrantha.

10. Wallichii.

14. comptoniæfolia.

13. dolichorrhiza.

11. Clarkei.

12. alaschanica.

16. Regeliana.

18. Roylei.

19. Oederi.

17. collata.

C.

B.

A.

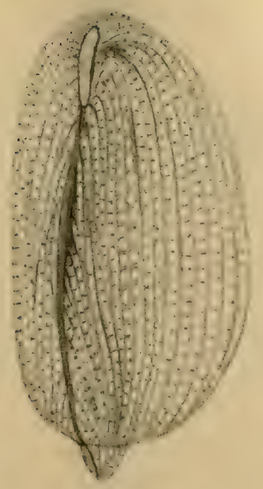
A. L. Singh delt.

A. PEDICULARIS CURVIPES Hook.f. B. PEDICULARIS, sp inc. C. Indian examples of Corolla-types.

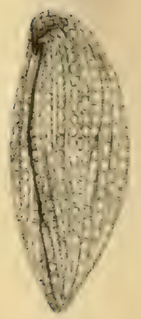
A. C. Mukerjei, lith.

RHINANTHOIDES, Schr.

LONGIFLORA, Rud.

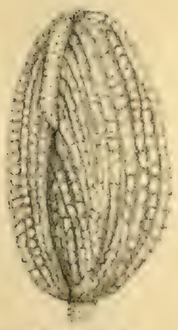


SIPHONANTHA, Don.

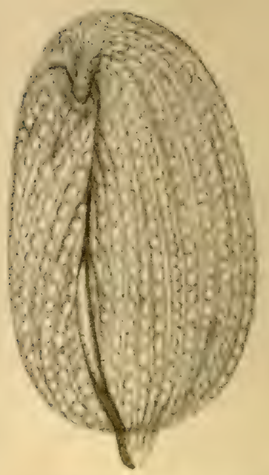


ROBUSTA, Hk.f

NEPALENSIS, Pr.



DALTONI, Pr.



MEGALANTHA, Don.

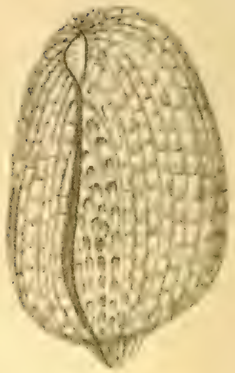
SCULLYANA, Pr.

REGELIANA, Pr.

CARNOSA, Wall.

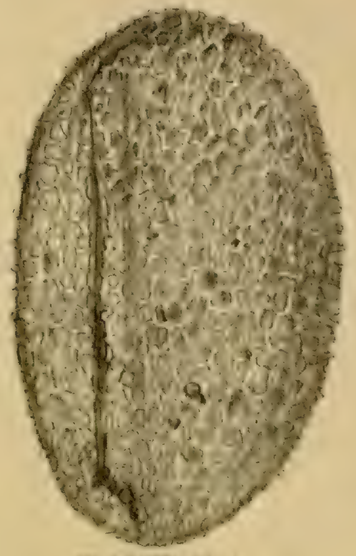
OEDERI, Vahl

DOLICHORRHIZA, Nobis.



Wall. Cat. 8666.

TRICHOGLOSSA, Hk.f.

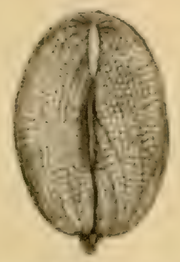


CLARKEI, Hk.f.

CORYMBOSA, Pr.

ZEYLANICA, Bedd.

CURVIFLORA, Hk.f.



FURFURACEA, Wall.

PANTLINGII, Pr.

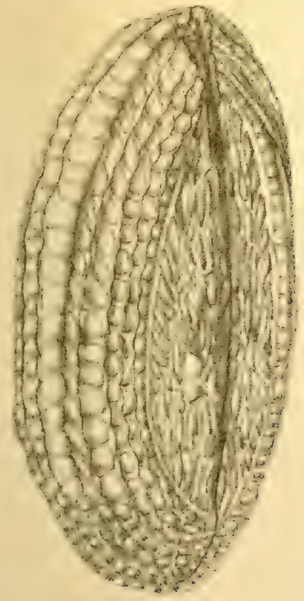
D. Prain del.

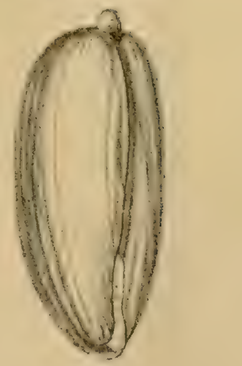
SEEDS OF INDIAN PEDICULARES, № I.

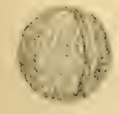
Lith. by A.C. Mukerjee.

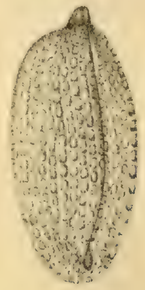
Ann. Roy. Bot. Gardens, Calcutta, Vol. 3.

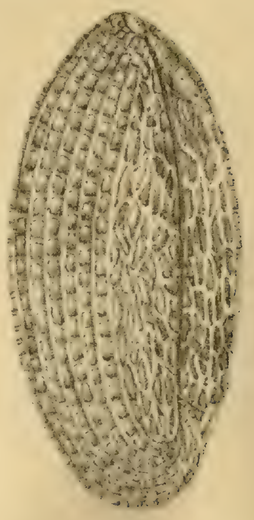
Prain, Pedicularis PLATE 38.

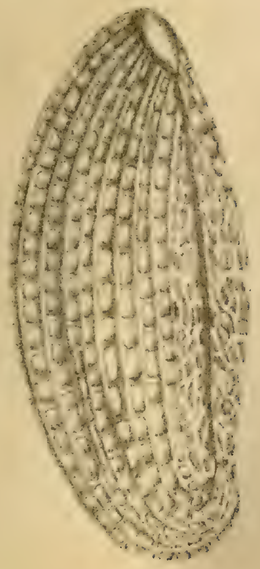












Drawn by A.L. Singh, Bot Gard. Calcutta.

ILLICIUM CAMBODIANUM, Hance

Photo-Lith. & Printed by W.H. Irving

EUPTELEA PLEIOSPERMA, Hook. fil. & Thoms.

PLATE 38.

ILLICIUM MUNIPURENSE, Watt.

ILLICIUM GRIFFITHII, Hook. fil. & Thoms.

Drawn by A. L. Sing, Bot. Gard Calcutta.

Photo-Lith. & Printed by W. H. Irving.

Drawn by E. Das, Bot. Garden, Calcutta.

TALAUMA KUNSTLERI, King.

Lith. and Printed by Kristchari Das.

CHIRANJIA PROPINQUA, Hook. Fil. and Thoms.

TALAUMA MANGERRA, Hook. f. and Thoms.

TALAUMA MITTARIENSIS, Bakar.

Drawn by G.C.Dass Bot. Gard. Calcutta.

MAGNOLIA MAINGAYI King

Photo-Lith & Printed by W.H.Irving

TALAUMA FORBESII King

PLATE 46.

4.

Drawn by A. L. Stagg, Bot. Garden, Calcutta.

Litho. at the Survey Office, Calcutta.

TALAUMA BABANIANA, Hook. Fil. and Thoms.

Drawn by A.D Mulla, Bot Garden Calcutta

Lith and Printed by Krishnahari Das

TALAUMA HODGSONI, Hook. Fil and Thom.

TALAUMA SPONGOCARPA, King.

TALAUMA PHELLOCARPA. King.

Drawn by G. Gibb, Bot. Garden, Calcutta

Litho. and Printed by Superintt. Press.

MAGNOLIA GRIFFITHII. Hook. fil. and Thoms.

Drawn by G. C. Ray, Bot. Garden, Calcutta. Lith. and Printed by Kristohari Das.

MAGNOLIA GRIFFITHII, Hook. Fl. and Thoms.

MAGNOLIA GLOBOSA, Hook. Fil. and Thoms.

Drawn by K.P Dass.

MAGNOLIA CAMPBELLII, Hook.fil. and Thoms.

Lith by A.C Mukerjee

Drawn by Kally Podo Dass.

MAGNOLIA CAMPBELLII, Hook. fil. and Thoms.

Lith. by A. C. Mukerjei.

Drawn by A.L. Singh.

MAGNOLIA PTEROCARPA, Roxb.

Lith. by A.C. Mukerjee.

Drawn by A. L. Singh.

Litht by A. C. Mukerjee.

MANGLIETIA SEBASSA, Miq

Drawn by A.L. Singh.

Lith. by A. C. Mukerjee.

MANGLIETIA INSIGNIS, Blume.

Drawn by A. Molla.

MANGLIETIA GLAUCA, Blume.

Lith. by A.C Mukerjee

Drawn by M Smith.

MANGLIETIA CAVEANA, Hook. fil. and Thoms.

Lith. by A. C Mukerjea.

Drawn by A. D. Mella.

MANGLIETIA CAVEANA, Hook. fil. and Thoms.

Lith. by A. C. Mukerjee

Photo-Lith & Printed by W.H.Irving

MANGLIETIA SCORTECHINII. King.

Drawn by G.C. Thom, Bot. Gard. Calcutta.

MICHELIA KISOPA. Hamt.

Drawn by A. L. Singh.

MAGNOLIA PEALIANA, King.

Drawn by G C Dass Roy Bot Gard Calcutta Vol 3

Photo Lith & Printed by W H Irving

MICHELIA CATHCARTII Hook.fil & Thoms.

MAGNOLIA GUSTAVI, King.

Drawn by A.D. Molla.

MICHELIA LANUGINOSA, Wall.

Lith. by A.C. Mukerjee.

Drawn by G. C. Dass, Roy. Bot. Gard. Calcutta

Photo-Lith & Printed by W.H. Irving.

MICHELIA EXCELSA, Blume.

Drawn by G.C.Dass

MICHELIA CHAMPACA, L.

Lith. by A. C. Mukerjei

Drawn by G.C.Dass Roy Bot Gard Calcutta

Photo Lith & Printed by W H Irving

MICHELIA NILAGIRICA Zenk.

Drawn by A. Lobenzi Ann. R. Bot. Gard. Calcutta

Photo Lith. & Printed at W. H. Lowe

MICHELIA PUNDUANA. Hook.fil. & Thoms

Drawn by G. C. Das from Nature Calcutta.

Lith. and Printed by Kristobhan Das.

MICHELIA OBLONGA, Wall.

Drawn by C. C. Dass, Roy. Bot. Gard. Calcutta.

Photo Lith & Printed by W. H. Irving.

MICHELIA MONTANA Blume.

SCHIZANDRA ELONGATA. Hook fil & Thoms

SCHIZANDRA GRANDIFLORA. Hook fil & Thoms

Photo-Lith & Printed by S. H. Irving

MICHELIA MANNII, King.

Drawn by A. D. Molla.

Lith. by A. C. Mukerjee

KADSURA SCANDENS, Bl.

Drawn by P. K. Das, Bot. Garden, Calcutta.

Cyth. and Printed by Photolitho, Dte.

KAEMPFERIA GRANDIFLORA, Wall.

Photo Lith & Printed by W H Irving

KADSURA ROXBURGHIANA Arn

KADSURA LANCEOLATA King

[illegible] WIGHTIANA, [illegible]

[illegible] AKULAPE, Hook. Fl. and Thoms.

G. C. Dass delt.

A. C. Singha lith.

GOMPHOSTEMMA WALLICHII Prain.

G. C. Das delt.

COMPHOSTEMMA STROBILINUM Wall. VAR. TYPICA.

A. L. Singh delt.

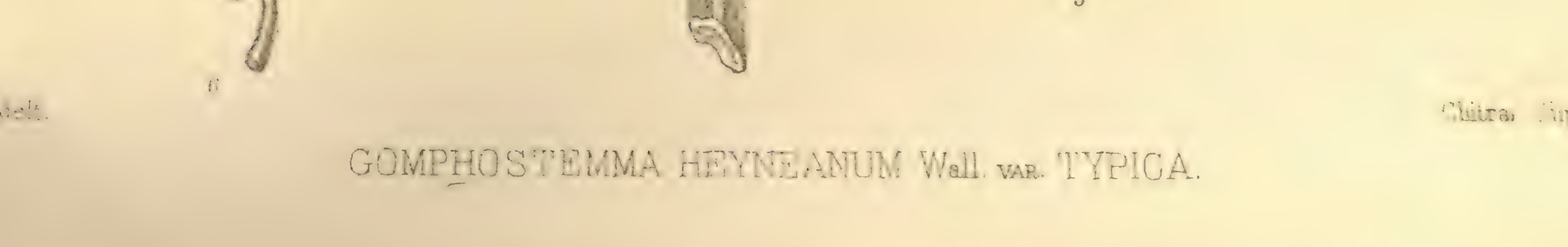
K. H. Das lith. et imp.

GOMPHOSTEMMA STROBILINUM Wall. var. VIRIDIS Hook. f.

GOMPHOSTEMMA STROBILINUM Wall. VAR. ACAULIS Prain.

A.L. Singh del.

A.C. Mukerjee, lith.



A. L. Singh delt.

Chitra Sipi Co. lith.

GOMPHOSTEMMA HEYNEANUM Wall. VAR. TYPICA.

A. L. Singh. delt.

K.D. Chandra lith.

GOMPHOSTEMMA HEYNEANUM Wall. VAR. ROTTLERI Prain.

A.L. Singh del.

GOMPHOSTEMMA NUTANS Hook.f.

A. K. Mukerjee

7.

6.

5.

4.

1.

2.

3.

K. C. Das delt.

K. H. Das lith.

GOMPHOSTEMMA HEMSLEYANUM Prain.

A. L. Singh delt

A. C. Singha. nth

GOMPHOSTEMMA NIVEUM Hook. f.

A. L. Singh delt.

A. C. Singha. lith.

GOMPHOSTEMMA MICROCALYX Pram.

K.C Dass delt.

GOMPHOSTEMMA THOMSONI Benth.

A.C Mukerjee lith.

G.C.Dass delt.

A.C.Mukerjea lith.

GOMPHOSTEMMA PARVIFLORUM Wall var TYPICA.

A. L. Singh delt.

GOMPHOSTEMMA PARVIFLORUM Wall. var FARINOSA Prain.

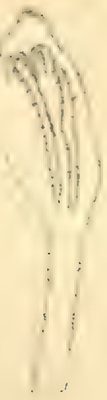
Calcutta Siliph. Co. Ltd.

GOMPHOSTEMMA CRINITUM Wall var. TYPICA.

A. L. Singh delt. J. G. Cumberbatch, lith.

GOMPHOSTEMMA CRINITUM Wall. A, VAR. TYPICA; B. VAR. GRIFFITHII Prain.

GOMPHOSTEMMA ERIOCARPON Benth.



4.

3.

7.

1.

6.

2.

5.

A.L. Singh del.

K.K. Das Photo-lith.

GOMPHOSTEMMA GURTISII Prain.

A. L. Singh delt.

GOMPHOSTEMMA SCORTECHINII Prain

A. C. Mukerjee lith.

A. L. Singh del.

GOMPHOSTEMMA LUCIDUM. Wall.

A. C. Singha Lith.

A. D. Mullan del:

K. D. Chandra lith.

GOMPHOSTEMMA OBLONGUM. Wall.

GAMPHOSTEMMA OVATUM Wall.

K.C. Basu & M. Smith, delt.

GOMPHOSTEMMA CHINENSE, Oliv.

A. D. Mulia delt.

A. C. Singha lith.

A. GUMPHOSTEMMA VELUTINUM Benth. B. G. MASTERSII Benth.

G.C. Dass del. K. D. Chandra lith.

GOMPHOSTEMMA MASTERSII Benth.

B

A

GOMPHOSTEMMA MELISSIFOLIUM Wall.

M Smith delt.

GOMPHOSTEMMA PHILIPPINARUM, Benth.

D. N. Choudhury del.

GOMPHOSTEMMA JAVANICUM, Benth.

E. R. Ivey lith.

A. D. Molla delt.

GOMPHOSTEMMA RUGOSUM Pram

A. C. Stroffolini lith.

A.D. Molla delt.

COMPTHOSTEMMA PHLOMOIDES, Benth.

Dutta & Dhar Ch^y lith.

SKETCH-MAP
OF
SOUTH EASTERN ASIA
illustrating the Distribution of the
GENUS GOMPHOSTEMMA

D. Prain, del.

A. C. Mukerjea, lith.

Ann. Roy. Bot. Garden, Calcutta, Vol. 3.

Prain, Gomphostemma, PLATE 105.

Drawn by G. C. Dass.

Lith. by K. D. Chandra.

MYRISTICA BRACTEATA. D.C.

Drawn by D. N. Chowdhury. Lith. by A. C. Singha.

MYRISTICA BRACTEATA. DC.

Drawn by M. Smith.

MYRISTICA MALACCENSIS, Hook. fil.

Lith. by A. C. Mukerjee.

Drawn by A. C. Motia

Litho by K.D. Chandra

MYRISTICA FRAGRANS, Houtt.

Drawn by J. D. Ivins

[illegible] by J. Chessenham

MYRISTICA MALABARICA Lamk.

Drawn by A. D. Mollo

Lith by J. C. Chuckerbutty

MYRISTICA GIGANTEA, King.

Drawn by K. P. Dass.

MYRISTICA CEYLANICA, A. DC.

Lith. by B. K. Roy.

Drawn by W.D. Alwis.

MYRISTICA LAURIFOLIA, Hook.fil and Thoms.

Lith. by Gimara Bilpi Co.

Drawn by A. D. Mella.

MYRISTICA ELLIPTICA, Wall

Litho by A.C. Gayne.

Drawn by G C Dass.

Lith. by A.C Mukerjee

MYRISTICA MAINGAYI, Hook. fil.

Orig. Myristica.

Ann. Roy. Bot. Garden Calcutta, Vol. I. Pl. XVI. p. 178

Drawn by S. N. Chowdery

Lithr by K. H. Das.

MYRISTICA ANDAMANICA, Hook. fil.

Drawn by A.D. Mellie

Lith. by K. [illegible]

MYRISTICA CINNAMOMEA, King.

Drawn by K. P. Das.

Lith. by K. P. Das.

MYRISTICA CRASSA, King.

Drawn by G. C. Deas

MYRISTICA REDDOMEI, King.

Drawn by A.D. Mulla.

MYRISTICA MAGNIFICA, Bedd.

Drawn by G. C. Das.

MYRISTICA LOWIANA, King.

Drawn by D.M. Cleverdon

MYRISTICA SUAVIS. K.g.

MYRISTICA HORSFIELDII Blume.

Lith. by J. C. Chatelain Imp.

Drawn by K. P. Dass.

Lith. by A. C. Singha.

MYRISTICA HORSFIELDII: Blume.

Drawn by M. C. Dass.

MYRISTICA FULVA, King.

Lith. by A. G. Mukerjee.

MYRISTICA SUPERBA, Wall. in Asiat. Trans.

Drawn by A. D. Mollo

MYRISTICA MURTONI, Hook f.

Lith. by A. G. Smyth

Drawn by D.N. Chaudhry

MYRISTICA FERRUGINEA, Wall.

Lith by A.C. Mukerjee.

Drawn by G. C. Das

Lith by K. M. Das.

MYRISTICA SUPERBA, Hook. fil. and Thoms.

Drawn by D.N.Choudhary.

MYRISTICA PRAINII, King.

Lith. by Dilo & Sept. Co.

Gen. Myristica

Ann. Roy. Bot. Gardens, Calcutta Vol. I. PLATE 127.

Drawn by A. D. Molla.

Lith. by K. D. Chandra.

MYRISTICA KINGII. Hook. fil.

Drawn by K.P. Dass

Lith by A. C. Sungha

MYRISTICA AMYGDALINA, Wall.

Drawn by D. N. Chowdhary.

Lith by K. D. Chowdhury.

MYRISTICA TOMENTOSA Hook.fil. and Th.

MYRISTICA RUBIGINOSA, King.

Lith. by A. C. Mukerjee.

Drawn by A. Molla.

MYRISTICA FLOCCULOSA, King.

Lith. by A. C. Mukerjee.

Drawn by A. L. Singh.

Lith. by A. C. Mukerjee.

MYRISTICA WALLICHII, Hook fil. et Thoms.

Drawn by A. Molla.

MYRISTICA WALLICHII, Hook.fil. and Thoms.

Lith. by A. C. Mukerjee

Drawn by G C.Dass.

MYRISTICA CANARIOIDES, King.

Lith. by Chitra Shp.Co.

Drawn by A. L. Singh.

MYRISTICA GRIFFITHII, Hook. fil.

Litt. by A. G. Mukerjee.

Drawn by A.C. Choudry.

Lith. by A. C. Mukerjee.

MYRISTICA FARQUHARIANA, Wall.

Drawn by A. Molla.

Litho by A. C. Mukerjee.

MYRISTICA FORBESII King

Drawn by K. P. Das.

MYRISTICA CANARICA. Bedd.

Lith. by A. C. Mukerjee.

Drawn by K.P. Dass.

MYRISTICA BIVALVIS, Hook. fil.

Litho by A.L. Mukerjee.

Drawn by D.N. Choudhary.

MYRISTICA CRASSIFOLIA Hook. fil. et Thoms.

Lith by A.C. Mukerjei.

Drawn by K. P. Dass.

MYRISTICA IRYA. Gaertn.

Lith by B. K. Roy.

Drawn by G C.Dass.

Lith. by Chitra Silpi C°

MYRISTICA IRYA, Gaertn.

Ann. Roy. Bot. Gard. Calcutta, Vol. 3, PLATE 142.

Drawn by G.C.Dass.

Lith. by A.C.Mukerjei.

MYRISTICA GLABRA, Blume.

5.

6.

8.

7

2.

3

Drawn by K. P. Das.

Lith. by P. K. Das.

MYRISTICA MAJUSCULA King.

Drawn by K.P. Das.

Lith. by K.P. Das

MYRISTICA BRACHIATA, King.

Drawn by G.C. Das.

Lith. by K.H. Das.

MYRISTICA RIDLEYANA, King.

Ann. Roy. Bot. Garden Calcutta, Vol. I. Pl. 10.

Drawn by G. C. Das.

Lith. by K. M. Basu.

MYRISTICA POLYSPHERULA, Hook. fil.

5

6

Drawn by, A. D. Molla

Lith by, A. D. Molla.

MYRISTICA COLLETTIANA, King.

Drawn by G.C. Dass

Lith. by K.D. Chandra

MYRISTICA OBLONGIFOLIA, King.

Drawn by A. D. Mollo

Lith. by K. D. Hendra

MYRISTICA KUNSTLERI, King

Drawn by G C Das

MYRISTICA CONFERTA King.

Lith by J C Chakrabarty

Drawn by K.P Dass

Lith by A.C Gupta

MYRISTICA WRAYI King

Drawn by W. H. Bates.

Lith. by J. C. Dansereau.

MYRISTICA ATTENUATA, Wall.

Drawn by D. N. Chowdhary.

Lith. by A. C. Singha.

MYRISTICA SCORTECHINII, King.

MYRISTICA INTERMEDIA, Blume.

Drawn by G. C. Dass.

Lith. by F. D. Pounds & Co.

MYRISTICA FURFURACEA, Hook. f. and Th.

Drawn by C.C.Das.

Lith by A.C.Singha.

MYRISTICA LAURINA, Blume.

Drawn by G. C. Das.

MYRISTICA GLAUCA, Blume.

Drawn by A. L. Singha.

MYRISTICA MISSIONIS, Wall.

Lith. by J. G. Gimsan Patna.

Drawn by A. D. Mullah.

MYRISTICA GIBBOSA, Hook. fil. and Thoms.

Drawn by D. N. Chowdery.

Lith by K. H. Das

MYRISTICA GEMINATA, Miq.

Drawn &c. by C. P. Sumner.

Lith. & Col. by Hullmandel.

MYRSICA ELLIPTICA (Roxb. and W.)

Drawn by K. P. Das.

Lith. by K. P. Das.

MYRISTICA ERRATICA, Hook. fil. and Thoms.

MYRISTICA HOOKERIANA. Wall.

Drawn by K. P. Dass

Lith. by A. C. Singha

MYRISTICA CLARKEANA, King.

MYRISTICA LONGIFOLIA. Wall.

MYRISTICA CURTISII, King.

Drawn by K. P. Das.

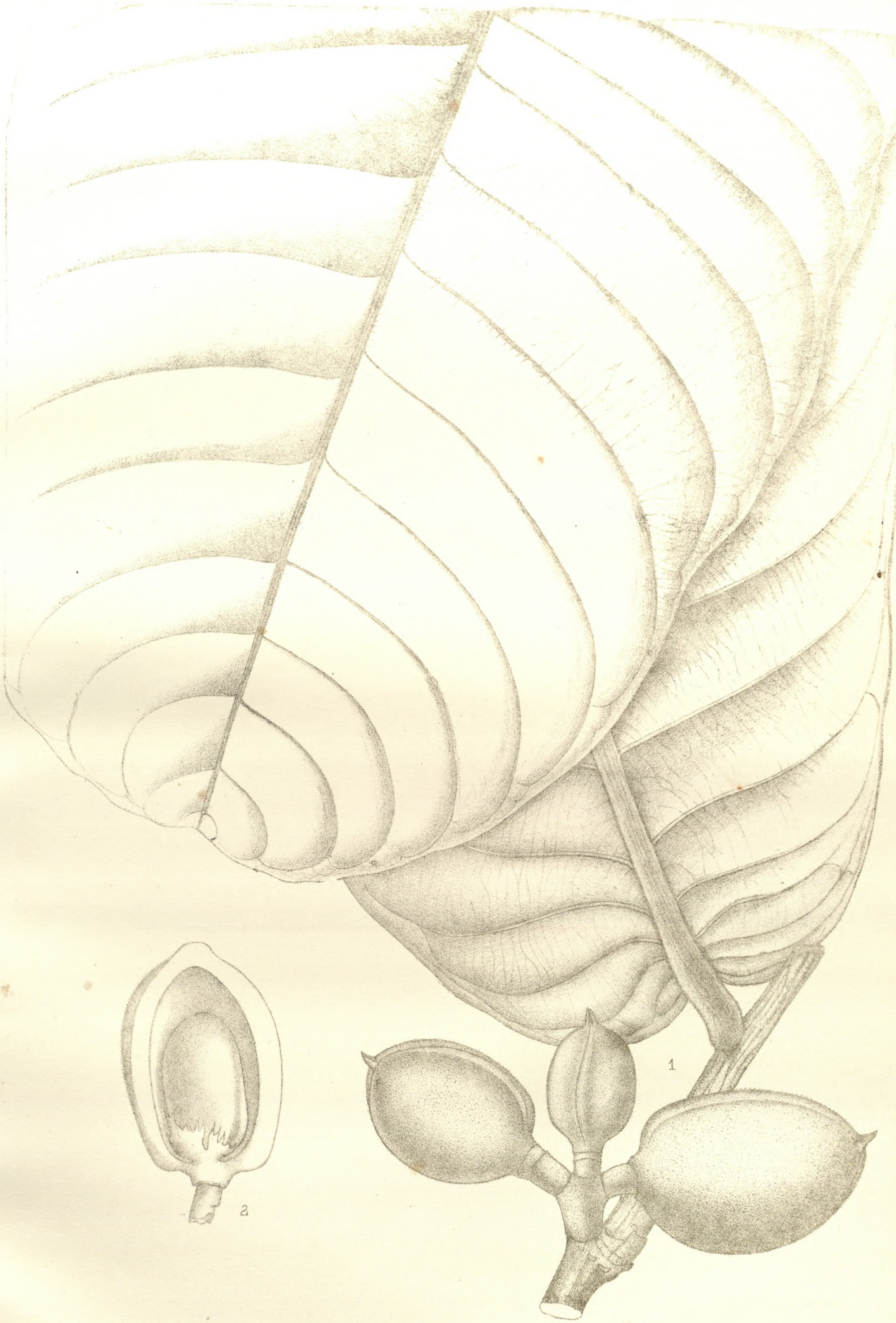
MYRISTICA CANTLEYI, Hook. fil.

Drawn by A. T. Mollet.

MYRISTICA PALUDICOLA, King.

Drawn by A. L. Stugh.

MYRISTICA PENDULINA. Hook f.



Drawn by G. C. Das.

Lith by K. H. Das.

MYRISTICA RETUSA, King.

Drawn by G. C. Dass.

MYRISTICA SUCOSA, King.

Lith. by A. C. Mukerjei.

Drawn by G.C. Dass.

MYRISTICA RACEMOSA, King.

Lith. by B.K.Roy.

3

4

1

2

Drawn by A.D. Molla.

MYRISTICA EXALTATA, Wall.

Lith by B.K. Roy.